STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243-1102

May 10, 2017

Mr. Anthony Massey
City Manager
e-copy: tmassey@columbiatn.com
City of Columbia
700 North Garden Street
Columbia, TN 38401

Subject: **Draft Modification of NPDES Permit No. TN0056103**
City of Columbia
Columbia, Maury County, Tennessee

Dear Mr. Massey:

Enclosed please find a draft copy of the NPDES Permit No. TN0056103, the Division of Water Resources proposes to modify subsequent to its issue in August 2016. This draft copy is furnished to you solely for your review of its provisions. No modified wastewater discharges are authorized by this draft permit. The issuance of this permit is contingent upon your meeting all of the requirements of the Tennessee Water Quality Control Act and the Rules and Regulations of the Tennessee Water Quality, Oil and Gas Board.

Also enclosed is a copy of the public notice that announces our intent to modify this permit. The notice affords the public an opportunity to review the draft modified permit and, if necessary, request a public hearing on this issuance process. If you disagree with the provisions and requirements contained in the draft permit, you have thirty (30) days from the date of this correspondence to notify the division of your objections. If your objections cannot be resolved, you may appeal this permit upon issuance. This appeal should be filed in accordance with Section 69-3-110 of the Tennessee Code Annotated.

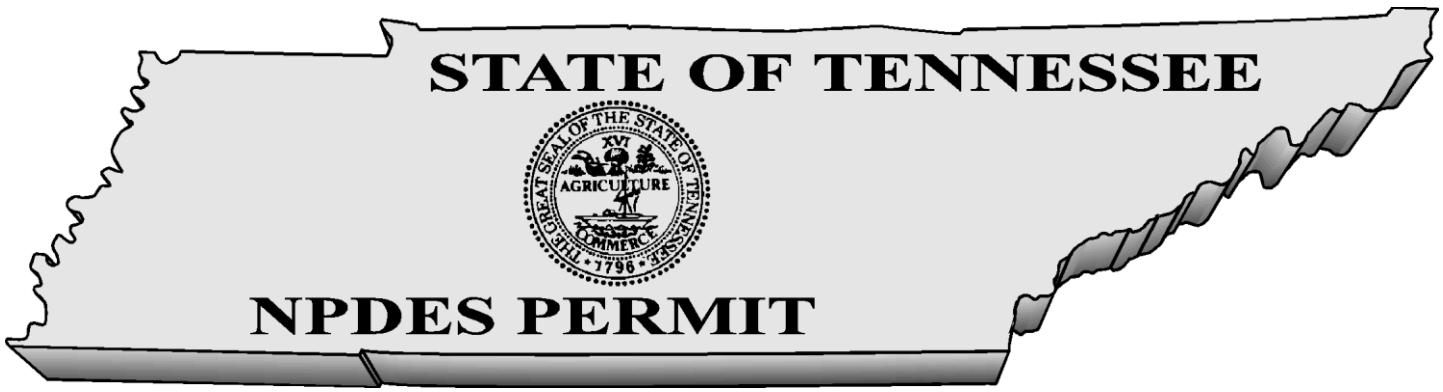
If you have questions, please contact the Columbia Environmental Field Office at 1-888-891-TDEC; or, at this office, please contact Mr. Wade Murphy at (615) 532-0666 or by E-mail at *Wade.Murphy@tn.gov*.

Sincerely,

Vojin Janjić
Manager, Water-Based Systems

Enclosure

cc: Mr. Mark Williams, Director, Columbia Wastewater System, mwilliams@columbiatn.com
Mr. J. Gregory Davenport, P.E., President, J.R. Wauford & Company Consulting Engineers, Inc., gregd@jrwauford.com
Ms. Karen Williams, Lab Supervisor, Columbia Wastewater System, mwilliams@columbiatn.com
Columbia EFO – DWR – dewitt.logsdon@tn.gov
Permit File



MODIFICATION

No. TN0056103

Authorization to discharge under the
National Pollutant Discharge Elimination System (NPDES)

Issued By

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243-1102

Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101 et seq.) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, et seq.)

Discharger: **City of Columbia**

is authorized to discharge: **treated municipal wastewater from Outfall 001**

from a facility known as: **Columbia STP, Maury County, Tennessee**

to receiving waters named: **Duck River at mile 127.2**

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on:

This permit shall expire on: **September 30, 2018**

Issuance date:

for Tisha Calabrese Benton
Director

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1.0. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1.1. NUMERIC AND NARRATIVE EFFLUENT LIMITATIONS

The City of Columbia is authorized to discharge treated municipal wastewater from Outfall 001 to the Duck River at mile 127.2. Discharge 001 consists of municipal wastewater from a treatment facility with a 14 MGD design capacity. Load limits and concentration limits are unrelated and are established as follows:

7 MGD
Load limits (lb/day) for monthly average and weekly average and concentration limits (mg/L) for daily maximum are retained from the 7 MGD permit to accommodate peak hydraulic flows through the treatment plant.

10 MGD
Concentration limits for monthly average and weekly average are water-quality based to protect instream dissolved oxygen. They are equivalent to a 10 MGD monthly average design flow rate. The division derived this limits via computer modeling. They are subject to change based on new information including, but not limited to, updated model calibration. This permit allows for revision to these limitations during the permit term per the reopener clause in Part 1.5.

The monthly average effluent flow rate is not limited in this permit. Limiting flow rate will become a consideration when the monthly average flow rate during dry weather approaches 10 MGD if the division and permittee have not mutually determined conditions for the 14 MGD design flow rate that is protective of water quality standards.

14 MGD
This permit authorizes the permittee to operate this 14 MGD facility as intended by the permittee to treat municipal wastewater and simultaneously reduce collection system overflows through peak flow treatment.

This table is provided for reference only. The complete set of effluent limitations are provided in the table that follows this table.

Effluent Characteristics	**Effluent Limitations**						**Monitoring Requirements**		
	Monthly Average Conc. (mg/l)	Monthly Average Amount (lb/day)	Weekly Average Conc. (mg/l)	Weekly Average Amount (lb/day)	Daily Maximum Conc. (mg/l)	Daily Minimum Percent Removal	Measurement Frequency	Sample Type	Sampling Point
$CBOD_5$	8 Report	**1460**	24.5	**2043**	**40** **Report**	40	5/week 5/week	composite composite	effluent influent
Ammonia as N (May 01 – October 31)	1	**292**	5.25	**438**	**10**		5/week	composite	effluent
Ammonia as N (November 01 – April 30)	1.5	**292**	7.9	**438**	**10**		5/week	composite	effluent
Suspended Solids	21 Report	**1751**	28	**2335**	**45** Report	40	5/week 5/week	composite composite	effluent influent

Discharge 001 shall be limited and monitored by the permittee as specified on the following pages:

Description : External Outfall, Number : 001, Monitoring : Effluent Gross, Season : All Year

Code	Parameter	Qualifier	Value	Unit	Sample Type	Frequency	Statistical Base
00300	Oxygen, dissolved (DO)	>=	6.0	mg/L	Grab	Five Per Week	Instantaneous Minimum
00400	pH	>=	6.0	SU	Grab	Five Per Week	Daily Minimum
00400	pH	<=	9.0	SU	Grab	Five Per Week	Daily Maximum
00530	Total Suspended Solids (TSS)	<=	21	mg/L	Composite	Five Per Week	Monthly Average
00530	Total Suspended Solids (TSS)	<=	1751	lb/d	Composite	Five Per Week	Monthly Average
00530	Total Suspended Solids (TSS)	<=	28	mg/L	Composite	Five Per Week	Weekly Average
00530	Total Suspended Solids (TSS)	<=	2335	lb/d	Composite	Five Per Week	Weekly Average
00530	Total Suspended Solids (TSS)	<=	45	mg/L	Composite	Five Per Week	Daily Maximum
00545	Settleable Solids	<=	1.0	mL/L	Grab	Five Per Week	Daily Maximum
00600	Nitrogen, total (as N)	Report	-	lb/d	Calculated	Quarterly	Quarterly Average
00600	Nitrogen, total (as N)	Report	-	mg/L	Composite	Quarterly	Quarterly Average
00610	Nitrogen, Ammonia total (as N)	<=	292	lb/d	Composite	Five Per Week	Monthly Average
00610	Nitrogen, Ammonia total (as N)	<=	438	lb/d	Composite	Five Per Week	Weekly Average
00610	Nitrogen, Ammonia total (as N)	<=	10	mg/L	Composite	Five Per Week	Daily Maximum
00665	Phosphorus, total (as P)	Report	-	mg/L	Composite	Monthly	Daily Maximum
00665	Phosphorus, total (as P)	Report	-	lb/d	Composite	Monthly	Daily Maximum
00665	Phosphorus, total (as P)	<=	150	lb/d	Calculated	Monthly	Rolling Average
50050	Flow	Report	-	Mgal/d	Continuous	Daily	Daily Maximum
50050	Flow	Report	-	Mgal/d	Continuous	Daily	Monthly Average
51040	E. coli	<=	126	#/100m	Grab	Five Per	Monthly

				L		Week	Geometric Mean
51040	E. coli	<=	487	#/100mL	Grab	Five Per Week	Daily Maximum
80082	CBOD, 5-day, 20 C	<=	8	mg/L	Composite	Five Per Week	Monthly Average
80082	CBOD, 5-day, 20 C	<=	1460	lb/d	Composite	Five Per Week	Monthly Average
80082	CBOD, 5-day, 20 C	<=	24.5	mg/L	Composite	Five Per Week	Weekly Average
80082	CBOD, 5-day, 20 C	<=	2043	lb/d	Composite	Five Per Week	Weekly Average
80082	CBOD, 5-day, 20 C	<=	40	mg/L	Composite	Five Per Week	Daily Maximum
TRP3B	IC25 Static Renewal 7 Day Chronic Ceriodaphnia	>	13	%	Composite	Quarterly	Minimum
TRP6C	IC25 Static Renewal 7 Day Chronic Pimephales	>	13	%	Composite	Quarterly	Minimum

Description : External Outfall, Number : 001, Monitoring : Effluent Gross, Season : Summer

Code	Parameter	Qualifier	Value	Unit	Sample Type	Frequency	Statistical Base
00610	Nitrogen, Ammonia total (as N)	<=	1.0	mg/L	Composite	Five Per Week	Monthly Average
00610	Nitrogen, Ammonia total (as N)	<=	5.25	mg/L	Composite	Five Per Week	Weekly Average

Description : External Outfall, Number : 001, Monitoring : Effluent Gross, Season : Winter

Code	Parameter	Qualifier	Value	Unit	Sample Type	Frequency	Statistical Base
00610	Nitrogen, Ammonia total (as N)	<=	1.5	mg/L	Composite	Five Per Week	Monthly Average
00610	Nitrogen, Ammonia total (as N)	<=	7.9	mg/L	Composite	Five Per Week	Weekly Average

Description : External Outfall, Number : 001, Monitoring : Percent Removal, Season : All Year

Code	Parameter	Qualifier	Value	Unit	Sample Type	Frequency	Statistical Base
80358	CBOD, 5-day, 20 C, % removal	>=	85	%	Calculated	Five Per Week	Monthly Average Minimum
80358	CBOD, 5-day, 20 C, % removal	>=	40	%	Calculated	Five Per Week	Daily Minimum

81011	TSS, % removal	>=	85	%	Calculated	Five Per Week	Monthly Average Minimum
81011	TSS, % removal	>=	40	%	Calculated	Five Per Week	Daily Minimum

Description : External Outfall, Number : 001, Monitoring : Raw Sewage Influent, Season : All Year

Code	Parameter	Qualifier	Value	Unit	Sample Type	Frequency	Statistical Base
00530	Total Suspended Solids (TSS)	Report	-	mg/L	Composite	Five Per Week	Daily Maximum
00530	Total Suspended Solids (TSS)	Report	-	mg/L	Composite	Five Per Week	Monthly Average
50050	Flow	Report	-	Mgal/d	Continuous	Daily	Monthly Average
50050	Flow	Report	-	Mgal/d	Continuous	Daily	Daily Maximum
80082	CBOD, 5-day, 20 C	Report	-	mg/L	Composite	Five Per Week	Monthly Average
80082	CBOD, 5-day, 20 C	Report	-	mg/L	Composite	Five Per Week	Daily Maximum

Description : External Outfall, Number : 001, Monitoring : Wet Weather, Season : All Year

Code	Parameter	Qualifier	Value	Unit	Sample Type	Frequency	Statistical Base
74062	Overflow use, occurrences	Report	-	occur/mo	Occurrences	Continuous	Monthly Total

Description : External Outfall, Number : 001, Monitoring : Dry Weather, Season : All Year

Code	Parameter	Qualifier	Value	Unit	Sample Type	Frequency	Statistical Base
74062	Overflow use, occurrences	Report	-	occur/mo	Occurrences	Continuous	Monthly Total

Description : External Outfall, Number : 001, Monitoring : All Weather, Season : All Year

Code	Parameter	Qualifier	Value	Unit	Sample Type	Frequency	Statistical Base
80998	Bypass of Treatment	Report	-	occur/mo	Occurrences	Continuous	Monthly Total

Notes: The permittee shall achieve 85% removal of $CBOD_5$ and TSS on a monthly average basis. The permittee shall report all instances of overflow and/or bypasses. See Part 2.3.3.a for the definition of overflow and Part 1.3.5.1 for reporting requirements.

***The quarterly total nitrogen load shall be calculated using the arithmetic average of all total nitrogen samples collected during the quarterly reporting period and the average effluent flow rate for the quarter.**

****The annual rolling average (lb/day) is calculated as the average of the weekly loads collected during the twelve month monitoring period beginning from the permit effective date. Each weekly load value shall be calculated using the average effluent flow rate for the date of the sample. The limit applies beginning the 12th month of**

permit effectiveness and reported on the DMR due the 15th of the following month. From this point forward, the annual load limit will apply monthly on the basis of the most recent twelve months of weekly samples.

Beginning the 12th month of permit effectiveness, the 114 lb/d total phosphorus becomes the limit (reported on the DMR due the 13th month following permit effectiveness and each month thereafter).

Unless elsewhere specified, summer months are May through October; winter months are November through April.

See Part 1.2.3 for test procedures.

See Part 3.4 for biomonitoring test and reporting requirements. See next page for percent removal calculations.

Total residual chlorine (TRC) monitoring shall be applicable when chlorine, bromine, or any other oxidants are added. The acceptable methods for analysis of TRC are any methods specified in Title 40 CFR, Part 136 as amended. The method detection level (MDL) for TRC shall not exceed 0.05 mg/l unless the permittee demonstrates that its MDL is higher. The permittee shall retain the documentation that justifies the higher MDL and have it available for review upon request. In cases where the permit limit is less that the MDL, the reporting of TRC at less than the MDL shall be interpreted to constitute compliance with the permit.

The wastewater discharge must be disinfected to the extent that viable coliform organisms are effectively eliminated. The concentration of the *E. coli* group after disinfection shall not exceed 126 cfu per 100 ml as the geometric mean calculated on the actual number of samples collected and tested for *E. coli* within the required reporting period. The permittee may collect more samples than specified as the monitoring frequency. Samples may not be collected at intervals of less than 12 hours. For the purpose of determining the geometric mean, individual samples having an *E. coli* group concentration of less than one (1) per 100 ml shall be considered as having a concentration of one (1) per 100 ml. In addition, the concentration of the *E. coli* group in any individual sample shall not exceed a specified maximum amount. A maximum daily limit of 487 colonies per 100 ml applies to lakes and exceptional Tennessee waters. A maximum daily limit of 941 colonies per 100 ml applies to all other recreational waters.

There shall be no distinctly visible floating scum, oil or other matter contained in the wastewater discharge. The wastewater discharge must not cause an objectionable color contrast in the receiving stream.

The wastewater discharge shall not contain pollutants in quantities that will be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.

Sludge or any other material removed by any treatment works must be disposed of in a manner that prevents its entrance into or pollution of any surface or subsurface waters. Additionally, the disposal of such sludge or other material must be in compliance with the Tennessee Solid Waste Disposal Act, TCA 68-31-101 et seq. and the Tennessee Hazardous Waste Management Act, TCA 68-46-101 et seq.

For the purpose of evaluating compliance with the permit limits established herein, where certain limits are below the State of Tennessee published required detection levels (RDLs) for any given effluent characteristics, the results of analyses below the RDL shall be reported as Below Detection Level (BDL), unless in specific cases other detection limits are demonstrated to be the best achievable because of the particular nature of the wastewater being analyzed.

For $CBOD_5$ and TSS, the treatment facility shall demonstrate a minimum of 85% removal efficiency on a monthly average basis. This is calculated by determining an average of all daily influent concentrations and comparing this to an average of all daily effluent concentrations. The formula for this calculation is as follows:

$$\left[1 - \frac{\text{average of daily effluent concentration}}{\text{average of daily influent concentration}}\right] \times 100\% = \% \text{ removal}$$

The treatment facility will also demonstrate 40% minimum removal of the $CBOD_5$ and TSS based upon each daily composite sample. The formula for this calculation is as follows:

$$\left[1 - \frac{\text{daily effluent concentration}}{\text{daily influent concentration}}\right] \times 100\% = \% \text{ removal}$$

1.2. MONITORING PROCEDURES

1.2.1. Representative Sampling

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to insure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than plus or minus 10% from the true discharge rates throughout the range of expected discharge volumes.

Samples and measurements taken in compliance with the monitoring requirements specified above shall be representative of the volume and nature of the monitored discharge, and shall be taken at the following location(s):

Influent samples must be collected prior to mixing with any other wastewater being returned to the head of the plant, such as sludge return. Those systems with more than one influent line must collect samples from each and proportion the results by the flow from each line.

Effluent samples must be representative of the wastewater being discharged and collected prior to mixing with any other discharge or the receiving stream. This can be a different point for different parameters, but must be after all treatment for that parameter or all expected change:

a. The chlorine residual must be measured after the chlorine contact chamber and any dechlorination. It may be to the advantage of the permittee to measure at the end of any long outfall lines.

b. Samples for *E. coli* can be collected at any point between disinfection and the actual discharge.

c. The dissolved oxygen can drop in the outfall line; therefore, D.O. measurements are required at the discharge end of outfall lines greater than one mile long. Systems with outfall lines less than one mile may measure dissolved oxygen as the wastewater leaves the treatment facility. For systems with dechlorination, dissolved oxygen must be measured after this step and as close to the end of the outfall line as possible.

d. Total suspended solids and settleable solids can be collected at any point after the final clarifier.

e. Biomonitoring tests (if required) shall be conducted on final effluent.

1.2.2. Sampling Frequency

Where the permit requires sampling and monitoring of a particular effluent characteristic(s) at a frequency of less than once per day or daily, the permittee is precluded from marking the “No Discharge” block on the Discharge Monitoring Report if there has been any discharge from that particular outfall during the period which coincides with the required monitoring frequency; i.e. if the required monitoring frequency is once per month or 1/month, the monitoring period is one month, and if the discharge occurs during only one day in that period then the permittee must sample on that day and report the results of analyses accordingly.

1.2.3. Test Procedures

a. Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304 (h) of the Clean Water Act (the "Act"), as amended, under which such procedures may be required.

b. Unless otherwise noted in the permit, all pollutant parameters shall be determined according to methods prescribed in Title 40, CFR, Part 136, as amended, promulgated pursuant to Section 304 (h) of the Act.

c. Composite samples must be proportioned by flow at time of sampling. Aliquots may be collected manually or automatically. The sample aliquots must be maintained at ≤ 6 degrees Celsius during the compositing period.

d. In instances where permit limits established through implementation of applicable water criteria are below analytical capabilities, compliance with those limits will be determined using the detection limits described in the TN Rules, Chapter 0400-40-03-.05(8).

1.2.4. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date and time of sampling;

b. The exact person(s) collecting samples;

c. The dates and times the analyses were performed;

d. The person(s) or laboratory who performed the analyses;

e. The analytical techniques or methods used, and;

f. The results of all required analyses.

1.2.5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation shall be retained for a minimum of three (3) years, or longer, if requested by the Division of Water Resources.

1.3. REPORTING

1.3.1. Monitoring Results

Monitoring results shall be recorded monthly and submitted monthly using Discharge Monitoring Report (DMR) forms supplied by the Division of Water Resources. Submittals shall be postmarked no later than 15 days after the completion of the reporting period. A completed DMR with an original signature shall be submitted to the following address:

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
COMPLIANCE & ENFORCEMENT SECTION
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243-1102

A copy of the completed and signed DMR shall be mailed to the Columbia Environmental Field Office (EFO) at the following address:

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES

Columbia Environmental Field Office
1421 Hampshire Pike
Columbia, Tennessee 38401

A copy should be retained for the permittee's files. In addition, any communication regarding compliance with the conditions of this permit must be sent to the two offices listed above.

The first DMR is due on the 15th of the month following permit effectiveness.

DMRs and any other information or report must be signed and certified by a responsible corporate officer as defined in 40 CFR 122.22, a general partner or proprietor, or a principal municipal executive officer or ranking elected official, or his duly authorized representative. Such authorization must be submitted in writing and must explain the duties and responsibilities of the authorized representative.

The electronic submission of DMR data will be accepted only if formally approved beforehand by the division. For purposes of determining compliance with this permit, data approved by the division to be submitted electronically is legally equivalent to data submitted on signed and certified DMR forms.

1.3.2. Additional Monitoring by Permittee

If the permittee monitors any pollutant specifically limited by this permit more frequently than required at the location(s) designated, using approved analytical methods as specified herein, the results of such monitoring shall be included in the calculation and reporting of the values required in the DMR form. Such increased frequency shall also be indicated on the form.

1.3.3. Falsifying Results and/or Reports

Knowingly making any false statement on any report required by this permit or falsifying any result may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Water Pollution Control Act, as amended, and in Section 69-3-115 of the Tennessee Water Quality Control Act.

1.3.4. Monthly Report of Operation

Monthly operational reports shall be submitted on standard forms to the appropriate Division of Water Resources Environmental Field Office in Jackson, Nashville, Chattanooga, Columbia, Cookeville, Memphis, Johnson City, or Knoxville. Reports shall be submitted by the 15th day of the month following data collection.

1.3.5. Bypass and Overflow Reporting

1.3.5.1. Report Requirements

A summary report of known or suspected instances of overflows in the collection system or bypass of wastewater treatment facilities shall accompany the Discharge

Monitoring Report. The report must contain the date and duration of the instances of overflow and/or bypassing and the estimated quantity of wastewater released and/or bypassed.

The report must also detail activities undertaken during the reporting period to (1) determine if overflow is occurring in the collection system, (2) correct those known or suspected overflow points and (3) prevent future or possible overflows and any resulting bypassing at the treatment facility.

On the DMR, the permittee must report the number of sanitary sewer overflows, dry-weather overflows and in-plant bypasses separately. Three lines must be used on the DMR form, one for sanitary sewer overflows, one for dry-weather overflows and one for in-plant bypasses.

1.3.5.2. Anticipated Bypass Notification

If, because of unavoidable maintenance or construction, the permittee has need to create an in-plant bypass which would cause an effluent violation, the permittee must notify the division as soon as possible, but in any case, no later than 10 days prior to the date of the bypass.

1.3.6. Reporting Less Than Detection

A permit limit may be less than the accepted detection level. If the samples are below the detection level, then report “BDL” or “NODI =B” on the DMRs. The permittee must use the correct detection levels in all analytical testing required in the permit. The required detection levels are listed in the Rules of the Department of Environment and Conservation, Division of Water Resources, Chapter 0400-40-03-.05(8).

For example, if the limit is 0.02 mg/l with a detection level of 0.05 mg/l and detection is shown; 0.05 mg/l must be reported. In contrast, if nothing is detected reporting “BDL” or “NODI =B” is acceptable.

1.4. COMPLIANCE WITH SECTION 208

The limits and conditions in this permit shall require compliance with an area-wide waste treatment plan (208 Water Quality Management Plan) where such approved plan is applicable.

1.5. REOPENER CLAUSE

This permit shall be modified, or alternatively revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 307(a)(2) and 405(d)(2)(D) of the Clean Water Act, as amended, if the effluent standard, limitation or sludge disposal requirement so issued or approved:

a. Contains different conditions or is otherwise more stringent than any condition in the permit; or

b. Controls any pollutant or disposal method not addressed in the permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

This permit may be reopened and modified, subject to permittee comment and appeal and applicable public notice procedures, to incorporate water quality based limits developed for the 14 MGD design flow rate based on water quality modeling accepted by the division. Adjustments may be made, based on new/updated modeling information, to effluent limits for $CBOD_5$, ammonia and TSS and any other effluent limits calculated based on design flow rate.

This permit may be reopened and modified, subject to permittee comment and appeal and applicable public notice procedures, to incorporate changes necessary to accommodate watershed planning requirements associated with total maximum daily load (TMDL) development or other pollutant reduction strategy by either the permittee or the State of Tennessee.

This permit may be reopened and modified, upon the permittee's request and subject to permittee comment and appeal and applicable public notice procedures, to reduce the whole effluent toxicity testing frequency after a minimum of 4 quarterly tests, conducted in consecutive quarters, demonstrate an absence of reasonable potential to exceed the IC_{25} in 13% effluent.

2.0. GENERAL PERMIT REQUIREMENTS

2.1. GENERAL PROVISIONS

2.1.1. Duty to Reapply

Permittee is not authorized to discharge after the expiration date of this permit. In order to receive authorization to discharge beyond the expiration date, the permittee shall submit such information and forms as are required to the Director of the Division of Water Resources (the "director") no later than 180 days prior to the expiration date. Such forms shall be properly signed and certified.

2.1.2. Right of Entry

The permittee shall allow the director, the Regional Administrator of the U.S. Environmental Protection Agency, or their authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or where records are required to be kept under the terms and conditions of this permit, and at reasonable times to copy these records;

b. To inspect at reasonable times any monitoring equipment or method or any collection, treatment, pollution management, or discharge facilities required under this permit; and

c. To sample at reasonable times any discharge of pollutants.

2.1.3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Water Pollution Control Act, as amended, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division of Water Resources. As required by the Federal Act, effluent data shall not be considered confidential.

2.1.4. Proper Operation and Maintenance

a. The permittee shall at all times properly operate and maintain all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes adequate laboratory and process controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems, which are installed by a permittee only when the operation is

necessary to achieve compliance with the conditions of the permit. Backup continuous pH and flow monitoring equipment are not required.

b. Dilution water shall not be added to comply with effluent requirements to achieve BCT, BPT, BAT and or other technology based effluent limitations such as those in State of Tennessee Rule 0400-40-05-.09.

2.1.5. Treatment Facility Failure (Industrial Sources)

The permittee, in order to maintain compliance with this permit, shall control production, all discharges, or both, upon reduction, loss, or failure of the treatment facility, until the facility is restored or an alternative method of treatment is provided. This requirement applies in such situations as the reduction, loss, or failure of the primary source of power.

2.1.6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

2.1.7. Severability

The provisions of this permit are severable. If any provision of this permit due to any circumstance, is held invalid, then the application of such provision to other circumstances and to the remainder of this permit shall not be affected thereby.

2.1.8. Other Information

If the permittee becomes aware of failure to submit any relevant facts in a permit application, or of submission of incorrect information in a permit application or in any report to the director, then the permittee shall promptly submit such facts or information.

2.2. CHANGES AFFECTING THE PERMIT

2.2.1. Planned Changes

The permittee shall give notice to the director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants, which are

subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1).

2.2.2. Permit Modification, Revocation, or Termination

a. This permit may be modified, revoked and reissued, or terminated for cause as described in 40 CFR 122.62 and 122.64, Federal Register, Volume 49, No. 188 (Wednesday, September 26, 1984), as amended.

b. The permittee shall furnish to the director, within a reasonable time, any information which the director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the director, upon request, copies of records required to be kept by this permit.

c. If any applicable effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established for any toxic pollutant under Section 307(a) of the Federal Water Pollution Control Act, as amended, the director shall modify or revoke and reissue the permit to conform to the prohibition or to the effluent standard, providing that the effluent standard is more stringent than the limitation in the permit on the toxic pollutant. The permittee shall comply with these effluent standards or prohibitions within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified or revoked and reissued to incorporate the requirement.

d. The filing of a request by the permittee for a modification, revocation, reissuance, termination, or notification of planned changes or anticipated noncompliance does not halt any permit condition.

2.2.3. Change of Ownership

This permit may be transferred to another party (provided there are neither modifications to the facility or its operations, nor any other changes which might affect the permit limits and conditions contained in the permit) by the permittee if:

a. The permittee notifies the director of the proposed transfer at least 30 days in advance of the proposed transfer date;

b. The notice includes a written agreement between the existing and new permittees containing a specified date for transfer of permit responsibility, coverage, and liability between them; and

c. The director, within 30 days, does not notify the current permittee and the new permittee of his intent to modify, revoke or reissue, or terminate the permit and to require that a new application be filed rather than agreeing to the transfer of the permit.

Pursuant to the requirements of 40 CFR 122.61, concerning transfer of ownership, the permittee must provide the following information to the division in their formal notice of intent to transfer ownership: 1) the NPDES permit number of the subject permit; 2) the effective date of the proposed transfer; 3) the name and address of the transferor; 4) the name and address of the transferee; 5) the names of the responsible parties for both the transferor and transferee; 6) a statement that the transferee assumes responsibility for the subject NPDES permit; 7) a statement that the transferor relinquishes responsibility for the subject NPDES permit; 8) the signatures of the responsible parties for both the transferor and transferee pursuant to the requirements of 40 CFR 122.22(a), "Signatories to permit applications"; and, 9) a statement regarding any proposed modifications to the facility, its operations, or any other changes which might affect the permit limits and conditions contained in the permit.

2.2.4. Change of Mailing Address

The permittee shall promptly provide to the director written notice of any change of mailing address. In the absence of such notice the original address of the permittee will be assumed to be correct.

2.3. NONCOMPLIANCE

2.3.1. Effect of Noncompliance

All discharges shall be consistent with the terms and conditions of this permit. Any permit noncompliance constitutes a violation of applicable state and federal laws and is grounds for enforcement action, permit termination, permit modification, or denial of permit reissuance.

2.3.2. Reporting of Noncompliance

a. 24-Hour Reporting

In the case of any noncompliance which could cause a threat to public drinking supplies, or any other discharge which could constitute a threat to human health or the environment, the required notice of non-compliance shall be provided to the Division of Water Resources in the appropriate Environmental Field Office within 24-hours from the time the permittee becomes aware of the circumstances. (The Environmental Field Office should be contacted for names and phone numbers of environmental response team).

A written submission must be provided within five days of the time the permittee becomes aware of the circumstances unless the director on a case-by-case basis waives this requirement. The permittee shall provide the director with the following information:

i. A description of the discharge and cause of noncompliance;

ii. The period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue; and

iii. The steps being taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.

b. Scheduled Reporting

For instances of noncompliance which are not reported under subparagraph 2.3.2.a above, the permittee shall report the noncompliance on the Discharge Monitoring Report. The report shall contain all information concerning the steps taken, or planned, to reduce, eliminate, and prevent recurrence of the violation and the anticipated time the violation is expected to continue.

2.3.3. Overflow

a. "**Overflow**" means any release of sewage from any portion of the collection, transmission, or treatment system other than through permitted outfalls.

b. Overflows are prohibited.

c. The permittee shall operate the collection system so as to avoid overflows. No new or additional flows shall be added upstream of any point in the collection system, which experiences chronic overflows (greater than 5 events per year) or would otherwise overload any portion of the system.

d. Unless there is specific enforcement action to the contrary, the permittee is relieved of this requirement after: 1) an authorized representative of the Commissioner of the Department of Environment and Conservation has approved an engineering report and construction plans and specifications prepared in accordance with accepted engineering practices for correction of the problem; 2) the correction work is underway; and 3) the cumulative, peak-design, flows potentially added from new connections and line extensions upstream of any chronic overflow point are less than or proportional to the amount of inflow and infiltration removal documented upstream of that point. The inflow and infiltration reduction must be measured by the permittee using practices that are customary in the environmental engineering field and reported in an attachment to a Monthly Operating Report submitted to the local TDEC Environmental Field Office. The data measurement period shall be sufficient to account for seasonal rainfall patterns and seasonal groundwater table elevations.

e. In the event that more than 5 overflows have occurred from a single point in the collection system for reasons that may not warrant the self-imposed moratorium or completion of the actions identified in this paragraph, the permittee may request a meeting with the Division of Water Resources EFO staff to petition for a waiver based on mitigating evidence.

2.3.4. Upset

a. "***Upset***" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. An upset shall constitute an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the permittee demonstrates, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   i. An upset occurred and that the permittee can identify the cause(s) of the upset;

   ii. The permitted facility was at the time being operated in a prudent and workman-like manner and in compliance with proper operation and maintenance procedures;

   iii. The permittee submitted information required under "Reporting of Noncompliance" within 24-hours of becoming aware of the upset (if this information is provided orally, a written submission must be provided within five days); and

   iv. The permittee complied with any remedial measures required under "Adverse Impact."

2.3.5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the waters of Tennessee resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

2.3.6. Bypass

a. "***Bypass***" is the intentional diversion of waste streams from any portion of a treatment facility. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypasses are prohibited unless all of the following 3 conditions are met:

i. The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;

ii. There are no feasible alternatives to bypass, such as the construction and use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass, which occurred during normal periods of equipment downtime or preventative maintenance;

iii. The permittee submits notice of an unanticipated bypass to the Division of Water Resources in the appropriate Environmental Field Office within 24 hours of becoming aware of the bypass (if this information is provided orally, a written submission must be provided within five days). When the need for the bypass is foreseeable, prior notification shall be submitted to the director, if possible, at least 10 days before the date of the bypass.

c. Bypasses not exceeding permit limitations are allowed **only** if the bypass is necessary for essential maintenance to assure efficient operation. All other bypasses are prohibited. Allowable bypasses not exceeding limitations are not subject to the reporting requirements of 2.3.6.b.iii, above.

2.3.7. Washout

a. For domestic wastewater plants only, a "washout" shall be defined as loss of Mixed Liquor Suspended Solids (MLSS) of 30.00% or more. This refers to the MLSS in the aeration basin(s) only. This does not include MLSS decrease due to solids wasting to the sludge disposal system. A washout can be caused by improper operation or from peak flows due to infiltration and inflow.

b. A washout is prohibited. If a washout occurs the permittee must report the incident to the Division of Water Resources in the appropriate Environmental Field Office within 24 hours by telephone. A written submission must be provided within five days. The washout must be noted on the discharge monitoring report. Each day of a washout is a separate violation.

2.4. LIABILITIES

2.4.1. Civil and Criminal Liability

Except as provided in permit conditions for "***Bypassing*****,**" "***Overflow,"*** and "***Upset*****,**" nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Notwithstanding this permit, the permittee shall remain liable for any damages sustained by the State of Tennessee, including but not limited to fish kills and losses of aquatic life and/or wildlife, as a result of the discharge of wastewater to any surface or subsurface waters. Additionally, notwithstanding this Permit, it shall be the responsibility of the permittee to conduct

its wastewater treatment and/or discharge activities in a manner such that public or private nuisances or health hazards will not be created.

2.4.2. Liability Under State Law

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or the Federal Water Pollution Control Act, as amended.

3.0. PERMIT SPECIFIC REQUIREMENTS

3.1. CERTIFIED OPERATOR

The waste treatment facilities shall be operated under the supervision of a certified wastewater treatment operator and the collection system shall be operated under the supervision of a certified collection system operator in accordance with the Water Environmental Health Act of 1984.

3.2. POTW PRETREATMENT PROGRAM GENERAL PROVISIONS

As an update of information previously submitted to the division, the permittee will undertake the following activity.

a. The permittee has been delegated the primary responsibility and therefore becomes the "control authority" for enforcing the 40 CFR 403 General Pretreatment Regulations. Where multiple plants are concerned the permittee is responsible for the Pretreatment Program for all plants within its jurisdiction. The permittee shall implement and enforce the Industrial Pretreatment Program in accordance with Section 403(b)(8) of the Clean Water Act, the Federal Pretreatment Regulations 40 CFR 403, Tennessee Water Quality Control Act Part 63-3-123 through 63-3-128, and the legal authorities, policies, procedures, and financial provisions contained in its approved Pretreatment Program, except to the extent this permit imposed stricter requirements. Such implementation shall require but not limit the permittee to do the following:

   i. Carry out inspection, surveillance, and monitoring procedures which will determine, independent of information supplied by the industrial user (IU), whether the IU is in compliance with the pretreatment standards;

   ii. Require development, as necessary, of compliance schedules for each IU for the installation of control technologies to meet applicable pretreatment standards;

   iii. Require all industrial users to comply with all applicable monitoring and reporting requirements outlined in the approved pretreatment program and IU permit;

   iv. Maintain and update, as necessary, records identifying the nature and character of industrial user discharges, and retain such records for a minimum of three (3) years;

   v. Obtain appropriate remedies for noncompliance by an IU with any pretreatment standard and/or requirement;

vi. Publish annually, pursuant to 40 CFR 403.8 (f)(2)(viii), a list of industrial users that have significantly violated pretreatment requirements and standards during the previous twelve-month period.

vii. Maintain an adequate revenue structure for continued operation of the pretreatment program.

viii. Update its Industrial Waste Survey at least once every five years. Results of this update shall be submitted to the Division of Water Resources, Pretreatment Section within 120 days of the effective date of this permit, unless such a survey has been submitted within 3 years of the effective date.

ix. Submit a written technical evaluation of the need to revise local limits within 120 days of the effective date of this permit to the state pretreatment program coordinator. The evaluation shall include the most recent pass-through limits proposed by the division. The technical evaluation shall be based on practical and specialized knowledge of the local program and not be limited by a specified written format.

b. The permittee shall enforce 40 CFR 403.5, "prohibited discharges". Pollutants introduced into the POTW by a non-domestic source shall not cause pass through or interference as defined in 40 CFR Part 403.3. These general prohibitions and the specific prohibitions in this section apply to all non-domestic sources introducing pollutants into the POTW whether the source is subject to other National Pretreatment Standards or any state or local pretreatment requirements.

Specific prohibitions. Under no circumstances shall the permittee allow introduction of the following wastes in the waste treatment system:

i. Pollutants which create a fire or explosion hazard in the POTW;

ii. Pollutants which will cause corrosive structural damage to the treatment works, but in no case discharges with pH less than 5.0 unless the system is specifically designed to accept such discharges.

iii. Solid or viscous pollutants in amounts which will cause obstruction to the flow in the treatment system resulting in interference.

iv. Any pollutant, including oxygen-demanding pollutants (BOD, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the treatment works.

v. Heat in amounts which will inhibit biological activity in the treatment works resulting in interference, but in no case heat in such quantities that the temperature at the treatment works exceeds 40°C (104°F) unless the works are designed to accommodate such heat.

vi. Any priority pollutant in amounts that will contaminate the treatment works sludge.

vii. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;

viii. Pollutants which result in the presence of toxic gases, vapors or fumes within the POTW in a quantity that may cause acute worker health and safety problems;

ix. Any trucked or hauled pollutants except at discharge points designated by the POTW.

c. The permittee shall notify the Tennessee Division of Water Resources of any of the following changes in user discharge to the system no later than 30 days prior to change of discharge:

i. New introductions into such works of pollutants from any source which would be a new source as defined in Section 306 of the Act if such source were discharging pollutants.

ii. New introductions of pollutants into such works from a source which would be subject to Section 301 of the "Federal Water Quality Act as Amended" if it were discharging such pollutants.

iii. A substantial change in volume or character of pollutants being introduced into such works by a source already discharging pollutants into such works at the time the permit is issued.

This notice will include information on the quantity and quality of the wastewater introduced by the new source into the publicly owned treatment works, and on any anticipated impact on the effluent discharged from such works. If this discharge necessitates a revision of the current NPDES permit or pass-through guidelines, discharge by this source is prohibited until the Tennessee Division of Water Resources gives final authorization.

d. Reporting Requirements

The permittee shall provide a semiannual report briefly describing the permittee's pretreatment program activities over the previous six-month period. Reporting periods shall end on the last day of the months of March and September. The report shall be submitted to the Division of Water Resources, Central Office and a copy to the appropriate Environmental Field Office no later than the 28th day of the month following each reporting period. For control authorities with multiple STPs, one report should be submitted with a separate Form 1 for each STP. Each report shall conform to the format set forth in the State POTW Pretreatment Semiannual Report Package which contains information regarding:

i. An updated listing of the permittee's industrial users.

ii. Results of sampling of the influent and effluent of the wastewater treatment plant. At least once each reporting period, the permittee shall analyze the wastewater treatment plant influent and effluent for the following pollutants, using the prescribed sampling procedures:

Pollutant	**Sample Type**
chromium, trivalent	24-hour composite
chromium, hexavalent	24-hour composite
total chromium	24-hour composite
copper	24-hour composite
lead	24-hour composite
nickel	24-hour composite
zinc	24-hour composite
cadmium	24-hour composite
mercury	24-hour composite
silver	24-hour composite
total phenols	grab
cyanide	grab

If any particular pollutant is analyzed more frequently than is required, the permittee shall report the maximum and average values on the semiannual report. All upsets, interferences, and pass-through violations must also be reported on the semiannual report, the actions that were taken to determine the causes of the incidents and the steps that have been taken to prevent the incidents from recurring.

At least once during the term of this permit, the permittee shall analyze the effluent from the STP (and report the results in the next regularly scheduled report) for the following pollutants:

chromium III	cyanide	phthalates, sum of the following: bis (2-ethylhexyl) phthalate butyl benzylphthalate di-n-butylphthalate diethyl phthalate
chromium VI	silver	
copper	benzene	
lead	carbon tetrachloride	
nickel	chloroform	
zinc	ethylbenzene	1,2 trans-dichloroethylene
cadmium	methylene chloride	tetrachloroethylene
mercury	naphthalene	toluene
phenols, total	1,1,1 trichloroethane	trichloroethylene
chromium, total		

iii. Compliance with categorical and local standards, and review of industrial compliance, which includes a summary of the compliance status for all

permitted industries. Also included is information on the number and type of major violations of pretreatment regulations, and the actions taken by the POTW to obtain compliance. The effluent from all significant industrial users must be analyzed for the appropriate pollutants at least once per reporting period.

iv. A list of industries in significant non-compliance as published in local newspapers in accordance with the requirements set forth in 40 CFR 403.8(f)(2)(viii).

v. A description of all substantive changes made to the permittee's pretreatment program. Any such changes shall receive prior approval. Substantive changes include, but are not limited to, any change in any ordinance, major modification in the program's administrative structure, local limits, or a change in the method of funding the program.

vi. Summary of permittee's industrial user inspections, which includes information on the number and type of industry inspected. All significant industrial users must be inspected at least once per year.

3.3. BIOSOLIDS MANAGEMENT PRACTICES

All sludge and/or biosolids use or disposal must comply with 40 CFR 503 et seq. Biosolids shall be sampled and analyzed at a frequency dependent on the amount used annually.

Any facility that land applies non-exceptional quality biosolids must obtain an appropriate permit from the division in accordance with Chapter 0400-40-15.

a. Reopener: If an applicable "acceptable management practice" or numerical limitation for pollutants in sewage sludge promulgated under Section 405(d)(2) of the Clean Water Act, as amended by the Water Quality Act of 1987, is more stringent than the sludge pollutant limit or acceptable management practice in this permit, or controls a pollutant not limited in this permit, this permit shall be promptly modified or revoked and reissued to conform to the requirements promulgated under Section 405(d)(2). The permittee shall comply with the limitations by no later than the compliance deadline specified in the applicable regulations as required by Section 405(d)(2) of the Clean Water Act.

b. Notice of change in sludge disposal practice: The permittee shall give prior notice to the director of any change planned in the permittee's sludge disposal practice. The current method of sludge disposal is to a municipal solid waste landfill (or co - composting facility). This method of disposal is controlled by the rules of the Tennessee Division of Solid Waste Management (DSWM) and Federal Regulations at 40 CFR 258. If the permittee anticipates changing its disposal practices to either land application or surface disposal, the Division of Water Resources shall be notified prior to the change. A copy of the results of pollutant analyses required by the Tennessee Division of Solid Waste

Management (DSWM) and / or 40 CFR 258 shall be submitted to the Division of Water Resources.

Division of Solid Waste Management			
Office	**Location**	**Zip Code**	**Phone No.**
Chattanooga	540 McCallie Avenue, Suite 550	37402-2013	(423) 634-5745
Jackson	1625 Hollywood Drive	38305	(731) 512-1300
Cookeville	1221 South Willow Avenue	38506	(931) 432-4015
Columbia	2484 Park Plus Drive	38401	(931) 380-3371
Johnson City	2305 Silverdale Road	37601	(423) 854-5400
Knoxville	3711 Middlebrook Pike	37921	(865) 594-6035
Memphis	8383 Wolf Lake Drive, Bartlett	38133-4119	(901) 371-3000
Nashville	711 R.S. Gass Boulevard	37243-1550	(615) 687-7000

3.4. BIOMONITORING REQUIREMENTS, CHRONIC

The permittee shall conduct a 3-Brood *Ceriodaphnia dubia* Survival and Reproduction Test and a 7-Day Fathead Minnow *(Pimephales promelas)* Larval Survival and Growth Test on samples of final effluent from Outfall 001.

The measured endpoint for toxicity will be the inhibition concentration causing 25% reduction in survival, reproduction and growth (IC_{25}) of the test organisms. The IC_{25} shall be determined based on a 25% reduction as compared to the controls, and as derived from linear interpolation. The average reproduction and growth responses will be determined based on the number of *Ceriodaphnia dubia* or *Pimephales promelas* larvae used to initiate the test.

Test shall be conducted and its results reported based on appropriate replicates of a total of five serial dilutions and a control, using the percent effluent dilutions as presented in the following table:

Serial Dilutions for Whole Effluent Toxicity (WET) Testing					
4 X PL	**2 X PL**	**Permit Limit (PL)**	**0.50 X PL**	**0.25 X PL**	**Control**
% effluent					
52	**26**	**13**	**6.5**	**3.25**	**0**

The dilution/control water used will be moderately hard water as described in Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, EPA-821-R-02-013 (or the most current edition). A chronic standard reference toxicant quality assurance test shall be conducted with each species used in the toxicity tests and the results submitted with the discharge monitoring report. Additionally, the analysis of this multi-concentration test shall include review of the concentration-response relationship to ensure that calculated test results are interpreted appropriately.

Toxicity will be demonstrated if the IC_{25} is less than or equal to the permit limit indicated for each outfall in the above table(s). Toxicity demonstrated by the tests specified herein constitutes a violation of this permit.

All tests will be conducted using a minimum of three 24-hour flow-proportionate composite samples of final effluent collected on days 1, 3 and 5. If, in any control more than 20% of the test organisms die in 7 days, the test (control and effluent) is considered invalid and the test shall be repeated within two (2) weeks. Furthermore, if the results do not meet the acceptability criteria in Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, EPA-821-R-02-013 (or the most current edition), or if the required concentration-response review fails to yield a valid relationship per guidance contained in Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing, EPA-821-B-00-004 (or the most current edition), that test shall be repeated. Any test initiated but terminated before completion must also be reported along with a complete explanation for the termination.

The toxicity tests specified herein shall be conducted quarterly (1/Quarter) for Outfall 001 and begin no later than 90 days from the effective date of this permit. See Part 1.5 for detail regarding modification of the quarterly monitoring frequency.

In the event of a test failure, the permittee must start a follow-up test within 2 weeks and submit results from a follow-up test within 30 days from obtaining initial WET testing results. The follow-up test must be conducted using the same serial dilutions as presented in the corresponding table(s) above. **The follow-up test will not negate an initial failed test. In addition, the failure of a follow-up test will constitute a separate permit violation.**

In the event of 2 consecutive test failures or 3 test failures within a 12-month period for the same outfall, the permittee must initiate a Toxicity Identification Evaluation/Toxicity Reduction Evaluation (TIE/TRE) study within 30 days and so notify the division by letter. This notification shall include a schedule of activities for the initial investigation of that outfall. **During the term of the TIE/TRE study, the frequency of biomonitoring shall be once every three months.** Additionally, the permittee shall submit progress reports once every three months throughout the term of the TIE/TRE study. The toxicity must be reduced to allowable limits for that outfall within 2 years of initiation of the TIE/TRE study. Subsequent to the results obtained from the TIE/TRE studies, the permittee may request an extension of the TIE/TRE study period if necessary to conduct further analyses. The final determination of any extension period will be made at the discretion of the division.

The TIE/TRE study may be terminated at any time upon the completion and submission of 2 consecutive tests (for the same outfall) demonstrating compliance. Following the completion of TIE/TRE study, the frequency of monitoring will return to a regular schedule, as defined previously in this section as well in Part I of the permit. **During the course of the TIE/TRE study, the permittee will continue to conduct toxicity testing of the outfall being investigated at the frequency of once every three months but will not be required to perform follow-up tests for that outfall during the period of TIE/TRE study.**

Test procedures, quality assurance practices, determinations of effluent survival/reproduction and survival/growth values, and report formats will be made in

accordance with Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, EPA-821-R-02-013, or the most current edition.

Results of all tests, reference toxicant information, copies of raw data sheets, statistical analysis and chemical analyses shall be compiled in a report. The report will be written in accordance with Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, EPA-821-R-02-013, or the most current edition.

Two copies of biomonitoring reports (including follow-up reports) shall be submitted to the division. One copy of the report shall be submitted along with the discharge monitoring report (DMR). The second copy shall be submitted to the local Division of Water Resources office address (see table below):

Division of Water Resources			
Office	**Location**	**Zip Code**	**Phone No.**
Chattanooga	540 McCallie Avenue, Suite 550	37402-2013	(423) 634-5745
Jackson	1625 Hollywood Drive	38305	(731) 512-1300
Cookeville	1221 South Willow Avenue	38506	(931) 432-4015
Columbia	2484 Park Plus Drive	38401	(931) 380-3371
Johnson City	2305 Silverdale Road	37601	(423) 854-5400
Knoxville	3711 Middlebrook Pike	37921	(865) 594-6035
Memphis	8383 Wolf Lake Drive, Bartlett	38133-4119	(901) 371-3000
Nashville	711 R.S. Gass Boulevard	37243-1550	(615) 687-7000

3.5. PLACEMENT OF SIGNS

Within sixty (60) days of the effective date of this permit, the permittee shall place and maintain a sign(s) at each outfall and any bypass/overflow point in the collection system. For the purposes of this requirement, any bypass/overflow point that has discharged five (5) or more times in the last year must be so posted. The sign(s) should be clearly visible to the public from the bank and the receiving stream. The minimum sign size should be two feet by two feet (2' x 2') with one-inch (1") letters. The sign should be made of durable material and have a white background with black letters.

The sign(s) are to provide notice to the public as to the nature of the discharge and, in the case of the permitted outfalls, that the discharge is regulated by the Tennessee Department of Environment and Conservation, Division of Water Resources. The following is given as an example of the minimal amount of information that must be included on the sign:

Permitted CSO or unpermitted bypass/overflow point:

UNTREATED WASTEWATER DISCHARGE POINT
Columbia STP
(931) 560-1510
NPDES Permit NO. TN0056103
TENNESSEE DIVISION OF WATER RESOURCES
1-888-891-8332 ENVIRONMENTAL FIELD OFFICE - Columbia

NPDES Permitted Municipal/Sanitary Outfall:

TREATED MUNICIPAL/SANITARY WASTEWATER
Columbia STP
(931) 560-1510
NPDES Permit NO. TN0056103
TENNESSEE DIVISION OF WATER RESOURCES
1-888-891-8332 ENVIRONMENTAL FIELD OFFICE - Columbia

No later than sixty (60) days from the effective date of this permit, the permittee shall have the above sign(s) on display in the location specified.

3.6. ANTIDEGRADATION

Pursuant to the Rules of the Tennessee Department of Environment and Conservation, Chapter 0400-40-03-.06, titled "Tennessee Antidegradation Statement," which prohibits the degradation of high quality surface waters and the increased discharges of substances that cause or contribute to impairment, the permittee shall further be required, pursuant to the terms and conditions of this permit, to comply with the effluent limitations and schedules of compliance required to implement applicable water quality standards, to comply with a State Water Quality Plan or other state or federal laws or regulations, or where practicable, to comply with a standard permitting no discharge of pollutants.

4.0. DEFINITIONS AND ACRONYMS

4.1. DEFINITIONS

"***Biosolids***" are treated sewage sludge that have contaminant concentrations less than or equal to the contaminant concentrations listed in Table 1 of subparagraph (3)(b) of Rule 0400-40-15-.02, meet any one of the ten vector attraction reduction options listed in part (4)(b)1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 of Rule 0400-40-15-.04, and meet either one of the six pathogen reduction alternatives for Class A listed in part (3)(a)3, 4, 5, 6, 7, or 8, or one of the three pathogen reduction alternatives for Class B listed in part (3)(b)2, 3, or 4 of Rule 0400- 40-15-.04.

A "***bypass***" is defined as the intentional diversion of waste streams from any portion of a treatment facility.

A "***calendar day***" is defined as the 24-hour period from midnight to midnight or any other 24-hour period that reasonably approximates the midnight to midnight time period.

A "***composite sample***" is a combination of not less than 8 influent or effluent portions, of at least 100 ml, collected over a 24-hour period. Under certain circumstances a lesser time period may be allowed, but in no case, less than 8 hours.

The "***daily maximum concentration***" is a limitation on the average concentration in units of mass per volume (e.g. milligrams per liter), of the discharge during any calendar day. When a proportional-to-flow composite sampling device is used, the daily concentration is the concentration of that 24-hour composite; when other sampling means are used, the daily concentration is the arithmetic mean of the concentrations of equal volume samples collected during any calendar day or sampling period.

"***Discharge***" or "discharge of a pollutant" refers to the addition of pollutants to waters from a source.

A "***dry weather overflow***" is a type of sanitary sewer overflow and is defined as one day or any portion of a day in which unpermitted discharge of wastewater from the collection or treatment system other than through the permitted outfall occurs and is not directly related to a rainfall event. Discharges from more than one point within a 24-hour period shall be counted as separate overflows.

"***Degradation***" means the alteration of the properties of waters by the addition of pollutants or removal of habitat.

“***De Minimis***” - Alterations, other than those resulting in the condition of pollution or new domestic wastewater discharges, that represent either a small magnitude or a short duration shall be considered a de minimis impact and will not be considered degradation for purposes of implementing the antidegradation policy. Discharges other than domestic wastewater will be considered de minimis if they are temporary or use less than five percent of the available assimilative capacity for the substance being discharged. Water withdrawals will be considered de minimis if less than five percent of the 7Q10 flow of the stream is removed (the calculations of the low flow shall take into account existing withdrawals). Habitat alterations authorized by an Aquatic Resource Alteration Permit (ARAP) are de minimis if the division finds that the impacts are offset by a combination of impact minimization and/or insystem mitigation.

If more than one activity has been authorized in a segment and the total of the impacts uses no more than ten percent of the assimilative capacity, available habitat, or 7Q10 low flow, they are presumed to be de minimis. Where total impacts use more than ten percent of the assimilative capacity, available habitat, or 7Q10 low flow they may be treated as de minimis provided that the division finds on a scientific basis that the additional degradation has an insignificant effect on the resource and that no single activity is allowed to consume more than five percent of the assimilative capacity, available habitat or 7Q10 low flow.

An “***ecoregion***” is a relatively homogeneous area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables.

The "***geometric mean***" of any set of values is the n^{th} root of the product of the individual values where “n” is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For the purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

A "***grab sample***" is a single influent or effluent sample collected at a particular time.

The "***instantaneous maximum concentration***" is a limitation on the concentration, in milligrams per liter, of any pollutant contained in the wastewater discharge determined from a grab sample taken from the discharge at any point in time.

The "***instantaneous minimum concentration***" is the minimum allowable concentration, in milligrams per liter, of a pollutant parameter contained in the wastewater discharge determined from a grab sample taken from the discharge at any point in time.

The "***monthly average amount***", shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.

The "***monthly average concentration***", other than for *E. coli* bacteria, is the arithmetic mean of all the composite or grab samples collected in a one-calendar month period.

A "***one week period***" (or "***calendar-week***") is defined as the period from Sunday through Saturday. For reporting purposes, a calendar week that contains a change of month shall be considered part of the latter month.

"***Pollutant***" means sewage, industrial wastes, or other wastes.

A "***quarter***" is defined as any one of the following three-month periods: January 1 through March 31, April 1 through June 30, July 1 through September 30, and/or October 1 through December 31.

A "***rainfall event***" is defined as any occurrence of rain, preceded by 10 hours without precipitation that results in an accumulation of 0.01 inches or more. Instances of rainfall occurring within 10 hours of each other will be considered a single rainfall event.

A "***rationale***" (or "fact sheet") is a document that is prepared when drafting an NPDES permit or permit action. It provides the technical, regulatory and administrative basis for an agency's permit decision.

A "***reference site***" means least impacted waters within an ecoregion that have been monitored to establish a baseline to which alterations of other waters can be compared.

A "***reference condition***" is a parameter-specific set of data from regional reference sites that establish the statistical range of values for that particular substance at least-impacted streams.

A **"*sanitary sewer overflow (SSO)*"** is defined as an unpermitted discharge of wastewater from the collection or treatment system other than through the permitted outfall.

"***Sewage***" means water-carried waste or discharges from human beings or animals, from residences, public or private buildings, or industrial establishments, or boats, together with such other wastes and ground, surface, storm, or other water as may be present.

"***Severe property damage***" when used to consider the allowance of a bypass or SSO means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass or SSO. Severe property damage does not mean economic loss caused by delays in production.

"***Sewerage system***" means the conduits, sewers, and all devices and appurtenances by means of which sewage and other waste is collected, pumped, treated, or disposed.

"***Sludge***" or "***sewage sludge***" is solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works.

A "***subecoregion***" is a smaller, more homogenous area that has been delineated within an ecoregion.

"***Upset***" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

The term, "***washout***" is applicable to activated sludge plants and is defined as loss of mixed liquor suspended solids (MLSS) of 30.00% or more from the aeration basin(s).

"***Waters***" means any and all water, public or private, on or beneath the surface of the ground, which are contained within, flow through, or border upon Tennessee or any portion thereof except those bodies of water confined to and retained within the limits of private property in single ownership which do not combine or effect a junction with natural surface or underground waters.

The "***weekly average amount***", shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar week when the measurements were made.

The "***weekly average concentration***", is the arithmetic mean of all the composite samples collected in a one-week period. The permittee must report the highest weekly average in the one-month period.

4.2. ACRONYMNS AND ABBREVIATIONS

1Q10 – 1-day minimum, 10-year recurrence interval

30Q20 – 30-day minimum, 20-year recurrence interval

7Q10 – 7-day minimum, 10-year recurrence interval

BAT – best available technology economically achievable

BCT – best conventional pollutant control technology

BDL – below detection level

BOD_5 – five day biochemical oxygen demand

BPT – best practicable control technology currently available

$CBOD_5$ – five day carbonaceous biochemical oxygen demand

CEI – compliance evaluation inspection

CFR – code of federal regulations

CFS – cubic feet per second

CFU – colony forming units

CIU – categorical industrial user

CSO – combined sewer overflow

DMR – discharge monitoring report

D.O. – dissolved oxygen

E. coli – Escherichia coli

EFO – environmental field office

LB(lb) - pound

IC_{25} – inhibition concentration causing 25% reduction in survival, reproduction and growth of the test organisms

IU – industrial user

IWS – industrial waste survey

LC_{50} – acute test causing 50% lethality

MDL – method detection level

MGD – million gallons per day

MG/L(mg/l) – milligrams per liter

ML – minimum level of quantification

ml – milliliter

MLSS – mixed liquor suspended solids

MOR – monthly operating report

NODI – no discharge

NOEC – no observed effect concentration

NPDES – national pollutant discharge elimination system

PL – permit limit

POTW – publicly owned treatment works

RDL – required detection limit

SAR – semi-annual [pretreatment program] report

SIU – significant industrial user

SSO – sanitary sewer overflow

STP – sewage treatment plant

TCA – Tennessee code annotated

TDEC – Tennessee Department of Environment and Conservation

TIE/TRE – toxicity identification evaluation/toxicity reduction evaluation

TMDL – total maximum daily load

TRC – total residual chlorine

TSS – total suspended solids

WQBEL – water quality based effluent limit

MODIFICATION RATIONALE

Columbia STP
NPDES Permit No. TN0056103
Date: April 15, 2017
Permit Writer: Wade Murphy

BACKGROUND

By letter dated September 26, 2016, the permittee appealed conditions of the permit issued August 31, 2016. The appealed conditions relate to effluent limitation and monitoring frequency for total phosphorous. The division is granting the permittee request to increase the phosphorus limit from the proposed 114 lb/day to 150 lb/day and is reducing the monitoring frequency for nutrients from weekly to monthly.

The division makes this decision on the information supplied by the permittee and in light of the statewide nutrient reduction framework. The division originally proposed the 114 lb/day limit consistent with a nutrient reduction strategy being utilized in 2014. The fact sheet dated 8/31/2014 and its Appendix 5 continue to be attached to this permit for reference purposes. That strategy in Appendix 5 has been superseded by the draft Statewide Nutrient Reduction Framework, dated March 2015, and its associated computer modeling for Tennessee River Watersheds. Neither the 150 lb/day limit nor the monthly monitoring and reporting frequency are back-sliding from the previous permit. The previous permit had no limit for phosphorus and the nutrient monitoring frequency was quarterly.

The division concurs that permit negotiations on the 2014 draft permit focused on the following parameters: $CBOD_5$, ammonia and TSS effluent limits and the design flow rate used to calculate load limits without any consideration of the newly proposed phosphorus limit. Subsequent to permit issue of this permit, Columbia re-evaluated the ability of its current process to meet the limit based on review of actual load values (concentrations and flow rates on the date of sampling). The permittee provided additional data points for consideration with their letter of September 26, 2016.

The division considered the following subsets of the data when it evaluated the new information supplied by the permittee:

- Effluent phosphorus in months when influent $CBOD_5$ was less than 150 mg/L suggesting both I/I and insufficient organic loading for conditions to be favorable to biological phosphorus removal, and

- Effluent phosphorus in months when influent $CBOD_5$ was greater than 150 mg/L suggesting minimal I/I impact and organic loading favorable to biological phosphorus removal.

This evaluation suggests the following conclusions:

- The 150 lb/d is the mathematical 95th percentile total phosphorus of daily load data reported between January 2009 and June 2016 inclusive,
- The Columbia STP is not designed for biological phosphorus removal, and
- The 114 lb/d proposed in the draft permit cannot be met by the current technology until I/I is effectively reduced. These conclusions stem from the following observations:

Regarding inability of the current treatment technology to remove phosphorus, the range of effluent phosphorus values, represented in TABLE 1 below as 95th percentile values for the 3 data subsets, is relative consistent (ranging only from 2.94 to 3.22 mg/l). This relatively constant value range for each subset of influent flow conditions suggests that biological phosphorus removal is not consistently occurring under any of the existing flow conditions.

Regarding an achievable load value of the current technology, the 95th percentile phosphorus load when influent $CBOD_5$ is greater than 150 mg/L (indicating minimal I/I impact and organic loading favorable to biological phosphorus removal) is 116.52 lb/d. This is comparable to the 114 lb/d value that the permittee appealed. The operating conditions conducive to obtaining that treatment level do not consistently occur and will not until Columbia removes sufficient I/I. The permittee is working on I/I removal under terms of its Administrative Order on Consent (AOC) with EPA. For the flow conditions when influent $CBOD_5$ was less than 150 lb/d, suggesting I/I and conditions not conducive to biological phosphorus removal, the 95th percentile effluent phosphorus load value was 165 lb/d. As indicated earlier, this is not related to the effluent phosphorus concentration but results from the increased flow rate. For the weak influent flow condition, the monthly average flow value plus 2 standard deviations for that dataset equals a flow rate of 14.22 MGD versus a comparable flow rate of only 5.28 MGD for the dataset of influent flows having stronger influent $CBOD_5$ greater than 150 mg/L.

Also supporting this decision is that fact that division SPARROW modeling for this HUC-10 watershed recommends that point source discharges maintain current treatment levels on the basis that point sources contribute a relatively small percentage of the total phosphorus load into this watershed. This means that point sources are considered to be in the low impact category with regard to phosphorus impact in the watershed. Phosphorus is naturally occurring in this geological area and remnants of phosphorus mining activities continue to exist in the vicinity of this wastewater treatment plant discharge. The 150 lb/day is equivalent to a discharge concentration of 1.3 mg/L at the actual design flow rate of 14 MGD. This current load value approximates the first level of treatment recommended when SPARROW modeling suggests that point sources are in a medium impact category on the watershed.

Finally, the new information documents that lower effluent phosphorus values result from dilution rather than biological reduction. The following page highlights that the three lowest values of 0.7 mg/L, 0.8 mg/L and 1.0 mg/L occurred on days when the average daily effluent flow rate was 11.19 MGD, 14.13 MGD, and 8.91 MGD respectively. And, as shown in Table 2 below, the corresponding monthly average influent $CBOD_5$ values were 73.5 mg/L, 119.7 mg/L and 79.7 mg/L respectively. For comparison, the textbook value for medium strength domestic sanitary sewage is about 200 mg/L $CBOD_5$[1]. Generally speaking, 150 mg/L BOD_5 is required to

[1] Table 15-1, *Sewerage and Sewage Treatment*, H. Babbitt, E. R. Baumann, John Wiley & Sons, Inc., 85th Edition, 1958

sustain good biological phosphorus removal when typical influent phosphorus is 6 mg/L and enhanced biological removal requires influent BOD_5 at a ratio of 25:1[2].

Below is the updated effluent data provided by Columbia via their appeal letter dated September 26, 2016.

Columbia, TN WWTP Flow & Effluent Phosphorus Data
2009-Present

Date	Effluent Flow (MGD)	Eff. Phosphorus (mg/l)	Eff. Phosphorus (total pounds)
1/29/2009	6.7929	1.7	96.3
3/26/2009	5.2005	2.8	121.4
7/23/2009	2.7285	2.9	66.0
3/20/2010	4.2766	1.4	49.9
7/28/2010	3.0415	2.8	71.0
9/10/2010	2.6543	2.9	64.2
12/17/2010	5.5388	1.3	60.1
3/25/2011	3.2819	2.3	63.0
6/10/2011	2.8565	3.4	81.0
9/16/2011	3.1750	2.6	68.8
12/9/2011	8.9100	1.0	74.3
3/9/2012	6.6900	1.5	83.7
6/15/2012	2.6400	3.1	68.3
9/14/2012	2.7600	2.9	66.8
12/11/2012	12.9300	1.4	151.0
3/22/2013	4.7100	1.3	51.1
6/18/2013	5.0100	3.0	125.4
9/18/2013	2.6700	2.2	49.0
12/13/2013	5.4600	3.3	150.3
3/5/2014	14.1300	0.8	90.7
6/6/2014	13.5900	2.6	294.7
9/17/2014	2.7725	2.9	67.1
12/12/2014	5.0400	1.2	50.4
3/19/2015	6.4500	1.3	69.9
6/12/2015	3.4738	2.0	57.9
9/4/2015	1.7500	2.6	37.5
12/4/2015	11.1882	0.7	65.5
3/11/2016	5.0218	1.6	68.7
6/2/2016	3.0325	2.8	71.3
Avg.	5.4405	2.1	84.0
Max.	14.1300	3.4	294.7
Min.	1.7500	0.7	37.5
	95% Percentile (1/28/2009-6/2/2016)	#/day	150.69

Below is a summary of the analysis of the above data:

[2] *Phosphorus Removal from Wastewater: A Primer* and *Enhanced Biological Phosphorus Removal*, G. Weaver, The Water Planet

TABLE 1

This summary table compares STP effluent flow, phosphorus concentrations and loads for three data sets: 1) All daily load data supplied by the permittee, 2) the subset of that data for months when influent was weak, and 3) the subset of that data in months when influent was less dilute.

SUMMARY: Analysis of the Permittee Effluent Data			
Subsets	Flow, STP Effluent	Phosphorus, STP Effluent 95th Percentile	
	(MGD) Average + 2 Std Dev	(mg/L)	(lb/d)
All Data	12.41	3.22	150.72
Weak Influent, CBOD5 < 150 mg/L	14.22	2.94	165.37
Strong Influent, CBOD5 > 150 mg/L	5.28	3.34	116.52

Below is the raw data and analysis used to create this table. It depicts the 3 sets of data described above. In the “all data” set, months with stronger effluent are identified with boxes. These boxed data become the second data subset that follows.

TABLE 2

Original Data Set:					
Statistic	Date	Influent CBOD5	Effluent Flow	Effluent TP	Effluent TP
		mg/L Mon Avg	MGD	mg/L	lbs
	1/29/2009		6.7929	1.7	96.3
	3/26/2009		5.2005	2.8	121.4
	7/23/2009		2.7285	2.9	66
	3/20/2010		4.2766	1.4	49.9
	7/28/2010		3.0415	2.8	71
	9/10/2010	173.1	2.6543	2.9	64.2
	12/17/2010	121.1	5.5388	1.3	60.1
	3/25/2011	149.7	3.2819	2.3	63
	6/10/2011	166.6	2.8565	3.4	81
	9/16/2011	100.3	3.1750	2.6	68.8
	12/9/2011	79.7	8.9100	1.0	74.3
	3/9/2012	132.1	6.6900	1.5	83.7
	6/15/2012	151.5	2.6400	3.1	68.3
	9/14/2012	111.0	2.7600	2.9	66.8
	12/11/2012	115.8	12.9300	1.4	151
	3/22/2013	109.2	4.7100	1.3	51.1
	6/18/2013	160.5	5.0100	3.0	125.4
	9/18/2013	120.6	2.6700	2.2	49
	12/13/2013	114.4	5.4600	3.3	150.3
	3/5/2014	119.7	14.1300	0.8	90.7
	6/6/2014	103.9	13.5900	2.6	294.7
	9/17/2014	138.7	2.7725	2.9	67.1
	12/12/2014	93.3	5.0400	1.2	50.4
	3/19/2015	89.3	6.4500	1.3	69.9
	6/12/2015	110.4	3.4738	2.0	57.9
	9/4/2015	140.2	1.7500	2.6	37.5
	12/4/2015	73.5	11.1882	0.7	65.5
	3/11/2016	93.5	5.0218	1.6	68.7
	6/2/2016	120.8	3.0325	2.8	71.3
Avg			5.44	2.15	83.98
SD			3.49	0.82	49.29
AVG +2XSD			12.41	3.80	182.56
95th percentile				3.22	150.72
Influent CBOD >150 mg/L:					
Statistic	Date	Influent CBOD5	Effluent Flow	Effluent TP	Effluent TP
		mg/L Mon Avg	MGD	mg/L	lbs
	9/10/2010	173.1	2.6543	2.9	64.2
	3/25/2011	149.7	3.2819	2.3	63
	6/10/2011	166.6	2.8565	3.4	81
	6/15/2012	151.5	2.6400	3.1	68.3
	6/18/2013	160.5	5.0100	3.0	125.4
Avg			3.29	2.94	80.38
SD			1.00	0.40	26.16
AVG +2XSD			5.28	3.75	132.70
95th percentile				3.34	116.52
Influent CBOD <150 w/ Outliers:					
Statistic	Date	Influent CBOD5	Effluent Flow	Effluent TP	Effluent TP
		mg/L Mon Avg	MGD	mg/L	lbs
	12/17/2010	121.1	5.5388	1.3	60.1
	9/16/2011	100.3	3.1750	2.6	68.8
	12/9/2011	79.7	8.9100	1.0	74.3
	3/9/2012	132.1	6.6900	1.5	83.7
	9/14/2012	111.0	2.7600	2.9	66.8
	12/11/2012	115.8	12.9300	1.4	151
	3/22/2013	109.2	4.7100	1.3	51.1
	9/18/2013	120.6	2.6700	2.2	49
	12/13/2013	114.4	5.4600	3.3	150.3
	3/5/2014	119.7	14.1300	0.8	90.7
	6/6/2014	103.9	13.5900	2.6	294.7
	9/17/2014	138.7	2.7725	2.9	67.1
	12/12/2014	93.3	5.0400	1.2	50.4
	3/19/2015	89.3	6.4500	1.3	69.9
	6/12/2015	110.4	3.4738	2.0	57.9
	9/4/2015	140.2	1.7500	2.6	37.5
	12/4/2015	73.5	11.1882	0.7	65.5
	3/11/2016	93.5	5.0218	1.6	68.7
	6/2/2016	120.8	3.0325	2.8	71.3
Avg			6.28	1.89	85.73
SD			3.97	0.81	58.67
AVG +2XSD			14.22	3.52	203.07
95th percentile				2.94	165.37

End of addendum to rationale.

ADDENDUM TO RATIONALE AT PERMIT ISSUE

Columbia STP
NPDES Permit No. TN0056103
Date: August 18, 2016
Permit Writer: Wade Murphy

BACKGROUND

This final permit presents its content in consideration of the issues resulting in 2 previous appeals of this permit. The division has made revisions only to the extent practical with limited water quality modeling. For ease of reference, this addendum includes a brief background on the issues. In the late 1990's, Columbia began taking actions to reduce/eliminate collection system overflows. Columbia decided to upsize its wastewater treatment plant beyond 7 MGD as part of that action. In 1997, the division issued "planning limits" for a 14 MGD facility. The wasteload allocations provided for that treatment plant expansion were based on a low stream flow of 130 cfs. Based on new information, the low flow in the Duck River at this location only approximates 100 cfs. Additionally, the wasteload allocation modeling associated with the "planning limits" predicted that ambient dissolved oxygen would dip slightly below the water quality standard of 5.0 mg/L at low flow conditions and the design flow rate of 14 MGD. However, in issuing these planning limits the division recognized the opportunity for additional modeling and discharge alternatives given that this larger flow rate was initially for peak flow conditions which would not likely happen at low stream flow conditions. Now 19 years later, the monthly average influent flow into the facility is 5.9 MGD. Due to attenuation within the treatment units themselves, the monthly average effluent flow rate is 5.0 MGD. The entire planning limit document is provided as Attachment 1 to this addendum.

In light of these reduced low flow and wet weather flow planning factors and the state's instantaneous minimum water quality standard of 5.0 mg/L for dissolved oxygen, the division could not honor these "planning limits" for a 14 MGD monthly average design flow rate and still be protective of water quality standards when Columbia completed construction of the 14 MGD facility. Therefore, several revised sets of limits have been proposed by the division using uncalibrated computer modeling and subsequently appealed by the permittee. It has been the permittee's intent to negotiate a mutually-agreeable an amicable resolution with the department rather than to proceed with judicial proceedings. The terms and conditions in this final permit are consistent with that intent. A summary of permit limits and planning limits is contained in Attachment 2 to this addendum.

This permit is issued pursuant to public notice of its reissue on September 2, 2014, in considerations of comments by the city and/or the city's design consultant and the Tennessee Clean Water Network. Additionally, the limits table in Part 1 of the final permit is revised to include numerical codes for all parameters and to list those parameters in numerical order by their code. This format is useful in implementing the electronic discharge monitoring report (DMR) reporting.

1. PERMITTEE CONSIDERATIONS

This final permit is revised in consideration of the permittee's concerns. By email dated October 1, 2014, J.R. Wauford and Company, on behalf of Columbia, suggested that limits from 2005 apply for 1 year while the permittee had consultants review the modeling on which the most recent effluent limits had been developed. Subsequently during negotiations, the consultant asked for the division to alternatively consider seasonal limits for $CBOD_5$, ammonia and TSS.

The division understands that the intent of both requests is to avoid being capped at limits that do not allow for maximum use of the 14 MGD design flow technology and that do not accommodate the hydraulic load on the plant during wet weather. To accommodate these concerns, the division proposes to formally allow the monthly and weekly load limits from the 7.0 MGD permit. Those limits have applied to the POTW administratively since September 1, 2003, because of permit appeals dated August 3, 2005, and November 12, 2009. These allow the permittee the greatest flexibility for managing peak flows through the treatment plant.

These load limits are applied in conjunction with the concentration limits established via dissolved oxygen modeling. Various scenarios were modeled. The limits protective of instream dissolved oxygen are associated with a modeled design flow rate of 10 MGD with the exception of winter ammonia concentrations. Based on ambient temperature data, the division is allowing a slight increase in the winter ammonia limit based on the temperature in winter being 4.5 degrees cooler than in summer (23.5 C summer; 19 C winter). That calculation is as follows using the low flow and wasteload allocation factors used elsewhere in this permit:

Low Stream Flow:= 100 cfs (64.6 MGD)
Wasteload Allocation Safety Factor: 50%
Difference in oxygen concentration at 100% saturation at summer/winter temps: 0.7 mg/L

Additional oxygen available in winter:

64.6 MG x 0.7 mg/L x 8.34= 377 lb/d x 50% safety factor = 188 lb/d.

Assuming it takes 4.5 lb oxygen to reduce 1 lb of ammonia, then 188 lb of oxygen will reduce 42 lb of ammonia per day: 188 lb x (1 lb ammonia/4.5 lb oxygen) = 42 lb ammonia

At the water quality discharge flow rate of 10 MGD, this ammonia allocation is equivalent to an effluent concentration of an additional 0.5 mg/L:

` 42 lb/d / (10 MGD x 8.34) = 0.5 mg/L.

This additional allocation added to the existing allocation of 1.0 mg/L yields 1.5 mg/L ammonia allowable during winter.

The ammonia loads for both summer and winter continue to be those loads carried over from the 7.0 MGD permit.

These revised conditions are not less stringent than the limits that continue to apply based on stays by previous permit appeals, so these revisions will not be subjected to additional public comment. Appeal rights by the permittee and third parties with standing apply.

In summary, these revisions do 2 things: 1) Allow for a relaxed ammonia limit during winter months and, 2) Make future limits, associated with operating and discharging at a 14 MGD, monthly average design flow rate, contingent based on updated water quality modeling. The revisions associated with item 2 include allowing formal use of the load limits from the 7.0 MGD permit and inclusion of specific reopener clause language. Load limits from the 7.0 MGD discharge permit have continued to apply based on permittee appeal of more stringent effluent limits calculated for a higher design flow rate than 7.0 MGD. Continuation of these load limits provide the permittee the greatest flexibility for handling peak flows associated with inflow and infiltration in the sewer system.

2. TENNESSEE CLEAN WATER NETWORK CONSIDERATIONS:

By letter dated October 6, 2014, the Tennessee Clean Water Network (TCWN) both expressed support for some of the originally proposed permit terms and conditions and also requested changes to others. In summary, the agency:

- Supported the proposed $CBOD_5$, ammonia, TSS and DO effluent limits,
- Supported continued I/I reduction via the Administrative Order on Consent that Columbia signed with EPA in July 2014,
- Requested a water quality based effluent limit for total phosphorus in terms of concentration,
- Requested the phosphorus effluent limit be imposed in terms of monthly average,
- Requested that the facility be required to remove phosphorus down to 0.3 mg/L,
- Requested that the permit make the phosphorus limit immediately effective, and
- Expressed dissatisfaction that permit appeals have not been resolved, and
- Respectfully disagreed with the state's interpretation that an appeal stays permit conditions.

The division has considered these requests but is not incorporating them specifically into the permit for the reasons outlined below. As part of this consideration, the division relooked at site specific information related to stream assessment and this discharger. The following facts present:

- For the reporting period from January 2014 through May 2016, discharge monitoring report data reflects the following effluent characteristics at Outfall 001 located at river mile 127.2:
  - $CBOD_5$ percent removals are >95% as a monthly average;
  - TSS percent removals are >95% as a monthly average;
  - Effluent ammonia is less than 1.0 mg/L as a monthly average;
  - Effluent TSS averages 4 mg/L;
- For the same reporting period, influent $CBOD_5$ averaged 111 mg/L;
- For the same reporting period, there were 27 wet weather overflows and 10 overflows for other reasons in the collection system;

- Ambient phosphorus samples downstream at river mile 125.2 were above the eco-region reference stream of 0.18 mg/L during August and September 2005. The samples values were 0.36 mg/L, 0.64 mg/L, 0.29 mg/L and 0.35 mg/L;
- This sampling location is along an inactive phosphate strip mining site containing tailings ponds;
- The macro-invertebrate assessment conducted by the division in July 2014, had a total score of 32 (passing) but presented low metric scores for high percentage of nutrient tolerant animals and low percentage of % EPT- Cheum (EPT abundance excluding *Cheumatopsyche*) animals which are generally more pollutant tolerant than other EPT.

All of this taken together suggests that the lower river quality water has several sources including the Outfall 001, its related collection system overflows, and non-point sources. In addition, the inflow and infiltration into the sewerage system makes it more difficult to remove phosphorus biologically from Outfall 001. Biological phosphorus removal is a function of wastewater strength, hydraulic retention time, and clarifier sludge age. Columbia's relatively weak influent and reduced hydraulic retention time during peak flow may reduce the uptake of phosphorus into solids. Oversized capacity for peak flow management may then enable old sludge age to result in release of phosphorus from solids back into the water column. So, to prevent worsening of the point source impact but to simultaneously allow Columbia continued focus on its collection system work via the EPA Consent Order on Agreement, this permit continues to apply the "capped" phosphorus load limit for the reasons explained in the rationale dated August 2014. The increased monitoring frequency of weekly will enable Columbia to consider effluent variability for purposes of optimizing phosphorus removal with inflow and infiltration removal to maintain the loading limit going forward.

Because of the several sources of phosphorus, the division cannot define a limit solely on Outfall 001 that will ensure the river achieves the narrative water quality criterion for nutrients. Additionally, the division's assessment of the river having unavailable conditions for phosphorus is not itself a reasonable potential determination that any individual activity within the watershed has the potential to cause or contribute to violation of a water quality criterion. Furthermore, because the relationships between ambient concentrations of nutrients and biological integrity and habitat have not been established, it is impossible to develop numerical limits for those relationships.

The EPA Administrative Order on Consent # CWA-04-2014-4752, executed July 15, 2014, requires several actions of Columbia related to the collection system. In part, it requires development of a Continuing Sewer System Assessment Program whereby at least 10% of the system is assessed each year. Among other requirements, the order on consent requires remediation plans for the wastewater collection and transmission system. These in turn are allowed to include expanded infrastructure for peak flow management. Therefore, optimization for phosphorus removal must continually consider the impacts of peak flow management on removal ability. To allow Columbia the greatest flexibility to do this, this permit refrains from specific optimization requirements or sampling. It is a given that Columbia will have to optimize for phosphorus removal in order to meet the load limit over time as population increases and phosphorus concentrations are less diluted via inflow and infiltration.

This addendum attaches the 1997 planning limits and a summary of previous permit limits and their status for ease of reference.

Addendum - Attachment 1

MEMORANDUM

Date: July7, 1997

To: Donald Ey, Nashville Field Office

From: Sherry Wang, Watershed Management Section

Re: Planning Limits for Columbia STP, Maury County

Donald, as we have discussed over the telephone, planning limits for the above referenced project is attached for your review.

I have used the Qual2E model for the waste load allocation. Model is calibrated with data from TVA's 1983 field Study. Stream hydraulic coefficients and exponents are derived from the power function relationship of flow with each stream reach's average velocity or depth. Stream background conditions, BOD and NH3-N decay rates are within the range of EPA/State agreement. Upon review of TVA's data, it is our determination that SOD is a sink of oxygen consumption during summer low flow condition and diurnal DO swing should be expected for this segment of Duck River.

Predictive modeling runs are based on the minimum flow of 130 cfs. Summer and winter limits are derived from maintaining minimum DO at approximately 5 mg/l. The proposed CBOD5/NH3-N/DO limit for the 14 MGD plant is 10,15/2,10/6 or 10,20/2,5/6 (summer, winter).

I suggest that we plan a joint agency assimilative capacity study which includes time of travel/dye trace, propane gas reaeration, and sediment oxygen demand. The K2 and SOD used for predictive modeling runs must be validated. The profile of ambient DO/BOD and location of DO sag point are also very needed field data.

Duck River is a group 3 watershed due to be in its planning step next year, 1998. One of the activities scheduled for years 1999 and 2000 is field data collection. We must collect additional field data to fill our existing data gap in order to fulfill the Qual 2E modeling needs.

Planning Standards For a Proposed Discharge

Columbia STP
River Mile 127.2 of Duck River
Design Capacity=14 MG

03-Jul-97

Effluent Characteristics	Effluent Limitations						Monitoring Requirements		
	Monthly Avg. Conc. mg/l	Monthly Avg. Amount lb/day	Weekly Avg. Conc. mg/l	Weekly Avg. Amount lb/day	Daily Max. Conc. mg/l	Daily Min. Percent Removal	Measurement Frequency	Sample Type	Sample Point
CBOD (5-Day)	10	1,168	15	1,751	20	40	7/week	composite	effluent
(May 1 -Oct. 31)	Report				Report		7/week	composite	influent
CBOD (5-Day)	15	1,751	20	2,335	25	40	7/week	composite	effluent
(Nov. 1 - Apr. 30)							7/week	composite	influent
Ammonia, N	2	234	3	350	4		7/week	composite	effluent
(May 1 - Oct. 31)									
Ammonia, N	10	1,168	15	1,751	20		7/week	composite	effluent
(Nov. 1 - Apr. 30)									
Suspended Slds.	30	3,503	40	4,670	45	40	7/week	composite	effluent
	Report				Report		7/week	composite	influent
Fecal Coliform	200/100 ml				1000/100 ml		7/week	grab	effluent
D.O.	6.0 instantaneous minimum						7/week	grab	effluent
Chlorine residual, T					0.13		7/week	grab	effluent
Settleable Slds. (ml/l)					1.0		7/week	composite	effluent
pH (units)	Instantaneous minimum and maximum - 6.5 - 8.5						7/week	grab	effluent
Flow	Report				Report		7/week	continuous	effluent
	Report				Report		7/week	continuous	influent

The annual minimum low flow for this segment = 130 cfs .

These limits are valid for one year from the date of issuance.

Composite samples are proportional-to-flow.

The total chlorine residual effluent limit is determined by mass balance calculation utilizing the EPA acute toxicity value of 0.019 mg/l for protection of fish and aquatic life.

Limitations and conditions contained herein are for planning and design purposes only and as such should not be construed as an indication that a permit will be issued for this project. Application for an NPDES permit should be filed as soon as a selected alternative is determined and project details are formulated.

For BOD and suspended solids, the arithmetic mean of the effluent sample results collected in a 30 day period shall not exceed 15 percent of the arithmetic mean of the influent samples collected in the same 30 day period as specified above (85% removal).

Date requested: March Requestor: Donald Ey Office: NFO

Type model used: Qual 2E Window USGS Quad: _____ NPDES #: TN0056103

Facility: Columbia STP Facility design flow (MGD/cfs): 14 MGD

City: Columbia County: Maury

Basin: Duck River (Lower) Stream: Duck River

Stream reach (miles): _____ Facility discharge point (mile): 127.2

Stream flow (3Q20): summer * 130 cfs Drainage area (mi^2): _____
winter _____ cfs

How 3Q20 was obtained: + TVA Guaranteed minimum flow. USGS gage # 03599500

Classified uses (check all applicable):

Domestic water supply: X (mile 71.5 - 123.2) Industrial water supply: X Recreation: X
Fish and aquatic life: X Livestock watering and wildlife: X
Irrigation: X Navigation: _____ Trout stream: _____

Point Loads:

Name	Flow (cfs)	Mile
1. Dupont (?)		129.7
2. Union Carbide		129.14
3.		
4.		
5.		

Withdrawals:

Name	Flow (cfs)	Mile
1.		
2.		
3.		
4.		
5.		

Significant tributaries:

Name		3Q20 (cfs)	Gage (mile)	Confluence (mile)	Drainage area (mi^2)
1. Rutherford Creek at	130.4	0			
2. Little Bigby Creek	127.9	0.55			
3. Knob Creek	125				
4. Greenlick Creek	122.9				
5.					

Use Kathy's data 3/16/95

tion	Description	Elevation (E) (Ft)	Mileage (M) (mi)	ΔE (ft)	ΔM (mi)	Slope (ft/mi)
		540	133.5			
	STP		127.2			
		520	116.6	-20	16.9	1.2

Segments (reaches): _____ Attach graph(s)

Name	Length (mi)	Slope (ft/mi)	Discharger/withdrawal/trib (Name & flow)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Background conditions:

Temperature: summer 27°C winter 17°C pH 7.5

CBOD: 1.5 N: 0.1 DO 6

3Q20: summer 130 cfs winter ____ TVA provided min. flow

Data obtained (X):

Storet ____

Agreement ✓

Other ____

Previous permit limits: 25/5/1

*Automatic removal rates used? yes SOD used? yes

*If no, see next pages for EPA recommended rates (1989 Qual2EU workshop). Circle rates used.

Instream NH_3-N (mass balance calculation)

Summer 1.28 mg/l Winter 2.11 mg/l

RUNS

		Proposed limits	Comments
Summer: 27°C	1.	10/2/6 (130cfs)	NH3-N OK; Sag 4.5 mg/l
	2.	5/2/6 (100cfs)	NH3-N OK; " 4.6 mg/l
	3.	6/1.2/6 (100cfs)	NH3-N OK; " 4.8 "
	4.		
Winter: 17°C	1.	20/5/6 (130cfs)	NH3-N OK; Sag 5.1 mg/l
	2.	15/10/6 (130cfs)	NH3-N OK; " 4.87 "
	3.	10/5/1 (100cfs)	NH3-N OK; 5.4 "
	4.		

Recommended Limits: 10, 15/2, 10/6

Comments:

TVA Report - 83 field work
Benthic oxygen demand - high
Diurnal shift in DO - significant
low flow ~140 cfs; high temp 30°C. DO below 5 mg/l

Advent Study - 86 field work
Benthic Oxygen demand - no
diurnal swing - no
low flow ~148 cfs, low temp 16°C, DO ~ 8 mg/l

K_1, $K_3 = 0.3$; $K_2 = 0.3$; SOD = 0.037 gm O_2/ft^2 or 0.4 gO_2/m^2; 27°C/17°C; Bkg = 1.5/0.1/6 used for predictive modeling runs.

- We should look into non-point source input. HSPF may be used.

Modeled: Alan Wang Date: 7/7/96

Approved: _____ Date: _____

- Duck / talked c̄ Joey
  no confident on model
  no data or study-as yet from WPC, TDEC
  matters are rather complex
- 100cfs = simply the absolute min # required for stream: F&A
  not say it needs to be used for design stream flow to allocate wastes,
  besides TVA is providing min flow anyway!
- if city want to get 30 cfs out for H₂O supply
  its their decision
- ∴ ~~we +~~ now I'll do 100 cfs, 130 cfs) runs

  < c̄ SOD – TVA's data > compared c̄ WPC's SOD data.
  ∴ reserved MOS high should be
  Harpeth River & Ky reservoir's SOD reports have higher SOD than TVA's Duck River #
- Duck is 83 |troshed c̄ TVA, USGS (Ann)
  We may want to do some joint project
  to calibrate, validate model
  or
  slaydon may want to help STP columbia, use
  — alternative approach in Franklin's strategy, to spray,
  etc during summer lowflow time
  — @ up & low
  ✱ Duck River watersheds need to do a long term plan
- spoke c̄ slaydon 6/30/97. alternative use not feasible for Columbia
  he indicated that from engineering standpoint, he can easily add
  additional sand filter ($1 million) to get Summer BOD to single digit number;
  he is also interested to get a higher winter min. flow number for
  winter WLA. Slaydon wants to know at <100 cfs > 14 MGD 6 or 7/1.2/6?
  slaydon's design of 14 MGD is to handle extra peak flow; his projected
  year 2020 flow is only 12 MGD

• less expensive to treat waste

Addendum - Attachment 2

Columbia STP, TN0056103
Duck River at mile 127.2

Issued: August 31, 1995
Expired: August 31, 2000
7 MGD, 1Q20=130 CFS

Revoke and reissue to coordinate expiration date with other permits in lower Duck River Watershed.

Issued: February 26, 1999
Expired: August 31, 2003
7 MGD, 1Q20=130 CFS

	Monthly Average		Weekly Average		Daily Maximum		Location
$CBOD_5$	25 mg/l	1460 lb/day	35 mg/l	2043 lb/day	40 mg/l	40% removal	Effluent
	Report				Report		Influent
Ammonia	5 mg/l	292 lb/day	7.5 mg/l	438 lb/day	10 mg/l		Effluent
D.O.					1 mg/l (daily minimum)		Effluent

The 130 CFS (84 MGD) stream flow was based on the 1Q20 low flow from the USGS publication, "Low Flows and Flow Duration of Tennessee Streams Through 1981" for USGS Gauging Station No. 03599500 located at the bridge on former U.S. Highway 31 at Columbia. The flow was determined for the period of 1977 through 1981 and the USGS cautioned that "Based on 5 years of record; the data given below may not be representative of flow."

****

1997 Planning limits
14 MGD, 1Q20= 130 CFS

	Monthly Average		Weekly Average		Daily Maximum		Location
$CBOD_5$ (summer)	10 mg/l	1168 lb/day	15 mg/l	1751 lb/day	20 mg/l	40% removal	Effluent
	Report				Report		Influent
$CBOD_5$ (winter)	15 mg/l	1751 lb/day	20 mg/l	2335 lb/day	25 mg/l	40% removal	Effluent
	Report				Report		Influent
Ammonia (summer)	2 mg/l	234 lb/day	3 mg/l	350 lb/day	4 mg/l		Effluent
Ammonia (winter)	10 mg/l	1168 lb/day	15 mg/l	1751 lb/day	20 mg/l		Effluent
D.O.					6 mg/l (daily minimum)		Effluent

(continued next page)

Issued: June 30, 2005
Effective: August 1, 2005
Expired: June 30, 2008
Appealed: August 3, 2005 2005
10 MGD, 1Q10= 103 CFS

Issued: September 30, 2009
Effective: November 1, 2009
Expired: September 30, 2013
Appealed: November 12, 2009
10 MGD, 1Q10= 103 CFS

	Monthly Average		Weekly Average		Daily Maximum		Location
$CBOD_5$ (summer)	10 mg/l	834 lb/day	24.5 mg/l	2043 lb/day	28 mg/l	40% removal	Effluent
	Report				Report		Influent
$CBOD_5$ (winter)	15 mg/l	1251 lb/day	24.5 mg/l	2043 lb/day	28 mg/l	40% removal	Effluent
	Report				Report		Influent
Ammonia (summer)	2 mg/l	167 lb/day	5.25 mg/l	438 lb/day	7 mg/l		Effluent
Ammonia (winter)	3.5 mg/l	292 lb/day	5.25 mg/l	438 lb/day	7 mg/l		Effluent
D.O.					6 mg/l (daily minimum)		Effluent

* Weekly and daily loads retained at 7 MGD (I/I pushed to WWTP).

100 CFS is the appropriate minimum flow for the following reasons:

The Water Quality Criteria rules changed such that we now use the 1Q10 low flow for regulated streams instead of the 1Q20. The 1996 USGS report, "Flow Duration and Low Flows of Tennessee Streams through 1992", utilizing 15 years of data for the Columbia gauge, indicated that the 1Q10 low flow is 103 CFS (66.6 MGD).

The division determined 100 CFS at river mile 132.8 to be the low flow threshold that supports designated uses by letter dated March 27, 1996 from Joe E. Holland, Jr. to Joe Cathey, Chief of Planning, U.S. Army Corps of Engineers.

At the division's request, the USGS recalculated the 1Q10 low flow to include the period from 1977 through 2002 (25 years record). The value was determined to be 111 CFS (71.8 MGD)-11/18/03 email from George Law.

TDEC authorizes the City of Columbia to withdraw up to 30 CFS of drinking water at Columbia via Aquatic Resource Alteration Permit number NRS #07.101 and requires the maintenance of at least 100 CFS in the Duck River (Effective September 24, 2009, Expires September 23, 2014).

RATIONALE

Columbia STP
NPDES Permit No. TN0056103
Date: 8/31/14
Permit Writer: Wade Murphy & Erin O'Brien

3. FACILITY INFORMATION

Columbia STP
Mr. Anthony Massey - City Manager
Columbia, Maury County, Tennessee
(931) 560-1510
Treatment Plant Average Design Flow: 14 MGD
Percentage Industrial Flow: 13% (based on average effluent flow rate)
Treatment Description: Secondary treatment with nitrification and UV disinfection. Activated sludge treated by aeration basin/aerobic digesters.
Certified Operator Grades: STP: IV; CS: II; Date Rated: >04/01/99

4. RECEIVING STREAM INFORMATION

Duck River at mile 127.2
Watershed Group: Duck-Lower
Hydrocode: 6040003
Low Flow: 1Q10 = 67 MGD (103 CFS)
Low Flow Reference:
USGS SWSTAT Analysis from 4/1/77 through 3/31/12, Station #03599500, Refer to Part 4 for additional detail.
Water Quality Status: Unavailable Conditions, Exceptional Tennessee Waters

Stream Classification Categories:

Domestic Wtr Supply	Industrial	Fish & Aquatic	Recreation
X	X	X	X
Livestock Wtr & Wlife	**Irrigation**	**Navigation**	
X	X		

Water Quality Assessment: Not supporting

5. CURRENT PERMIT STATUS

Permit Type:	Municipal
Classification:	Major
Issuance Date:	30-SEP-09
Effective Date:	01-NOV-09
Expiration Date:	30-SEP-13
Appealed:	12-NOV-09
Issuance Date:	30-JUN-05
Effective Date:	01-AUG-05
Expiration Date:	30-JUN-08
Appealed:	03-AUG-05
Issuance Date:	26-FEB-99
Effective Date:	01-MAR-99
Expiration Date:	31-AUG-03

According to TCA 4-5-320 and 40 CFR 124.16, when a permit is appealed, the contested permit conditions are stayed. A facility holding an existing permit must comply with the conditions of the existing permit that correspond to the stayed conditions. The following table summarizes which permit conditions from the previous two permits have been appealed and lists which permit's effluent limitations are enforceable.

Limited Parameter	Appealed in 2005?	Appealed in 2009?	Source of Enforceable Limit
$CBOD_5$	Yes	Yes	1999 permit
Ammonia	Yes	Yes	1999 permit
Total Nitrogen	No	No	2009 permit
Total Phosphorous	No	No	2009 permit
Suspended Solids	No	No	2009 permit
E. coli	No	No	2009 permit
Settleable Solids	No	No	2009 permit
Dissolved Oxygen	No	No	2009 permit
pH	No	No	2009 permit
IC25	No	No	2009 permit
Cyanide	No	N/A	N/A
Design Capacity	Yes	Yes	N/A

6. NEW PERMIT LIMITATIONS AND COMPLIANCE SCHEDULE SUMMARY

a. Numeric and Narrative Changes

This permit proposes to limit $CBOD_5$ and ammonia with year-round limits versus summer/winter limits. These parameters were limited by year-round limits prior to 1999. Since then, seasonal limits were proposed but appealed for reasons not related to seasonality. Updated modeling used for this permit did not consider seasonal limits. See Section 6.1 below for additional detail.

The whole effluent toxicity testing frequency is increased from annually to quarterly based on some toxicity demonstrating in the 2012 analysis. The permit reopener clause in Part 1.5 allows for the permit to be reopened and modified to change the monitoring frequency after four consecutive quarters of results demonstrating an absence of reasonable potential for toxicity in toxic amounts.

This permit incorporates new terms and conditions that comply with new state regulations for biosolids. Refer to Section 7.4 of the rationale and Section 3.3 of the permit.

Additionally, a total phosphorus limit is added for anti-degradation purposes related to the division's assessed nutrient impairment of the Duck River. The limit is consistent with the division's anticipated nutrient reduction strategy at the build-out design flow rate, so the permit does not include specific terms and conditions related to optimization of the facility. Additionally, the benthic community of the Duck rate consistent with reference stream goals, so the permit does not include terms and conditions associated with stream monitoring or assessments. See Section 8 and Appendix 5 below for additional explanation. It is the intent of this permit to enable the permittee to focus on inflow and infiltration removal pursuant to its federal consent agreements with the EPA as indicated in Section 5 below.

b. Critical Low River Flow

The critical low flow of the Duck River used in developing permit terms and conditions is not changed from the previous permit. However, the division did reevaluate the basis for the flow number as part of the reissue process. The value of 103 cfs reflects an updated flow estimate by the United States Geological Survey (USGS) with reduction for a water withdrawal allocation not reflected in the measured flows.

USGS staff analyzed flow data from April 1, 1977 through March 31, 2013, via a computer program (SWSTAT) and calculated the 1Q10 flow to be 113 cfs at river mile 132.8. This is documented in an email from Mr. Shannon Williams of the USGS to Ms. Erin O'brien of TDEC dated 12/4/13. Then the division reviewed water withdrawal records for the permitted withdrawal located at river mile 134 and permitted by TDEC via ARAP permit # NRS07.101. This location is upstream of the USGS gage at river mile 132.8, so the 1Q10 estimate reflects actual withdrawal rates. The withdrawal permit authorizes up to 30 cfs as an instantaneous maximum as long as minimum flow of 100 cfs is maintained in the river. During 2013, the maximum withdrawal rates reported for January was 20.39 cfs, for June was 22.26 cfs and for August was 22.54 cfs. The difference between these values and the 30 cfs allowed by the ARAP permit is being incorporated in this permit as 10 cfs for simplicity and in the absence of statistically valid $\pm$ percent error rates for the gage flows, 1Q10 estimate, and withdrawal values. So, 113 cfs less 10 cfs = 103 cfs.

Additionally, flows from tributary streams were considered via modeling to see if they could be incorporated into updated wasteload allocations. Those considerations are detailed in Section 6.1 below.

c. Compliance Schedule Summary

Description of Report to be Submitted	Reference Section in Permit
Monthly Discharge Monitoring Reports	1.3.1
Monthly Operational Reports	1.3.4
Monthly Bypass and Overflow Summary Report	1.3.5.1
Industrial Waste Survey Report within 120 days of the effective permit date	3.2.a
Biomonitoring Report beginning within 90 days of the effective permit date	3.4

7. PREVIOUS PERMIT DISCHARGE MONITORING REPORT REVIEW

A review of the DMR summary from August 2010-September 2013, in comparison with the enforceable effluent limitations (as shown in Appendix 1), reveals that Columbia STP:

- Exceeded the daily max concentration limit for ammonia in April 2012,
- Exceeded the E. coli daily max limit in November 2010 and October 2012, and
- Has reported 58 wet weather overflows and 15 dry weather overflows.

The City of Columbia has signed an Administrative Order on Consent (AOC) in July 2014 and a Consent Agreement (CA) in August 2014 with EPA for violations of the federal Clean Water Act associated with its collection system overflows. The Consent Agreement will become effective in the near future after it is executed by the EPA and filed with the hearing clerk.

A complete discharge monitoring report summary is located in Appendix 2.

8. PROPOSED EFFLUENT LIMITS AND RATIONALE

PARAMETERS	MONTHLY AVERAGE CONCENTRATION (MG/L)	MONTHLY AVERAGE AMOUNT (LB/DAY)	WEEKLY AVERAGE CONCENTRATION (MG/L)	WEEKLY AVERAGE AMOUNT (LB/DAY)	DAILY MAXIMUM CONCENTRATION (MG/L)	DAILY MINIMUM PERCENT REMOVAL	RATIONALE
$CBOD_5$	8	667	24.5	2043	28	40	D.O. protection, Refer to 6.1
NH_3-N	1	83	4.2	438	7	—	D.O. protection, Refer to 6.2 below
Total Suspended Solids	21	1751	28	2335	31	40	T.C.A. 400-40-05-.09; anti-degradation
Dissolved Oxygen (mg/l)	6.0 (daily minimum) instantaneous	—	—	—	—	—	D.O. protection, Refer to 6.1 below
Total Nitrogen*	—	—	—	—	Report (qtr avg)	Report (qtr load)	Refer to 6.4 below
Total Phosphorous**	114 lb/d, annual rolling average (reported monthly after 12 months of permit effectiveness)						Refer to Appendix 5
Total Phosphorous	Report	Report	—	—	Report	Report	Refer to 8.0 and Appendix 5 below
E. coli (colonies/100ml)	126/100 ml	—	—	—	487/100 ml	—	T.C.A. 400-40-03-.03, Refer to 6.5 below
Settleable Solids (ml/l)		—	—	—	1.0 (daily maximum)	—	T.C.A. 0400-40-05-.09
pH (standard units)	6.0-9.0	—	—	—	—	—	T.C.A. 0400-40-03-.03
Flow (MGD):							
Influent	Report	—	—	—	Report	—	Used to quantify pollutant load
Effluent	Report	—	—	—	Report	—	Used to quantify pollutant load
Whole Effluent Toxicity:							
IC_{25}	13% per sample	—	—	—	—	—	Refer to 6.6 below
Metals & Toxics:							Refer to 6.7 below
Sanitary Sewer Overflows, Total Occurrences			Report				Refer to 6.9 below
Dry Weather Overflows, Total Occurrences			Report				Refer to 6.9 below
Bypass of Treatment, Total Occurrences			Report				Refer to 6.9 below

Note: Weekly limitations on $CBOD_5$ and TSS concentrations are given as required per 40 CFR 133.102(a)(2) or 133.102(a)(4)(2) & 133.102 (b)(2) respectively; daily $CBOD_5$ and TSS limitations are authorized by T.C.A. 0400-40-05-.09; monthly and weekly mass loads are limited per 40 CFR 122.45(f) and based on the design flow as per 40 CFR 122.45(b); monthly average percent removal rates for $CBOD_5$ and TSS are required per 40 CFR 133.102(a)(3) or 133.102(a)(4)(iii) and 133.102 (b)(3) respectively. A minimum 40% daily removal rate is required as equivalent to a daily mass load limitation.

***The quarterly total nitrogen load shall be calculated using the arithmetic average of all total nitrogen samples collected during the quarterly reporting period and the average effluent flow rate for the quarter.**

****The annual rolling average (lb/day) is calculated as the average of the weekly loads collected during the twelve month monitoring period beginning from the permit effective date. Each weekly load value shall be calculated using the average effluent flow rate for the date of the sample. The limit applies beginning the 12th month of permit effectiveness and reported on the DMR due the 15th of the following month. From this point forward, the annual load limit will apply monthly on the basis of the most recent twelve months of weekly samples.**

6.1. $CBOD_5$, DISSOLVED OXYGEN, AND PERCENT REMOVALS REQUIREMENTS

a. Computer modeling (Qual2E) was performed at various conditions to determine allowable organic loadings and to see whether the small flows contributed by tributary streams to the Duck River would allow for an increased wasteload allocation. The modeling predicts that the best scenario for instream dissolved oxygen will occur when limiting the discharge flow rate to 10 MGD with effluent limitations of 8 mg/L $CBOD_5$, 1 NH_3-N and 6 mg/L dissolved oxygen. Even so, the ambient oxygen is predicted to sag to 5.15 mg/L and assuming complete mix across the river, no sediment oxygen demand or nutrient demand. Modeling results are located in the permit file administrative record. A summary of the model results is provided below:

Qual2E Model Run Results - December 2013					
Duck River Flow	TN0056103 Flow	Effluent Limits	Lowest DO	Tribuary In-flow	
		CBOD/HN3-N/DO			
cfs	MGD	mg/L	mg/L		
100	7	10/2/6	5.07	no	
100	10	10/2/6	4.68	no	
100	10	10/2/6	4.7	yes	
113	10	10/2/6	4.8	yes	
100	10	8/1/6	5.15	no	
100	10	10/0.8/6	5	no	
100	14	8/0.7/7	5.04	no	

Below is a comparison of the $CBOD_5$ and NH_3-N limits effective in 1999 and proposed in this permit:

7 MGD Permit						
Parameter	Monthly		Weekly		Daily	
	mg/L	lb/d	mg/L	lb/d	mg/L	(lb/d)
CBOD5	25	1460	35	2043	40	(≈ 2335)
NH3-N	5	292	7.5	348	10	(≈584)
10 MGD Permit (14 MGD Design limited to 10 MGD for Water Quality)						
Parameter	Monthly		Weekly		Daily	
	mg/L	lb/d	mg/L	lb/d	mg/L	(lb/d)
CBOD5	8	667	24.5	2043	28	(≈ 2335)
NH3-N	1	83	4.2	348	7	(≈584)

Monthly average $CBOD_5$ and NH_3-N loads are reduced from the 7 MGD permit. The limits established for 7 MGD were necessary to maintain ambient dissolved oxygen of 5 mg/L. Therefore an increased design flow rate requires more

stringent concentrations to maintain the ambient oxygen. The weekly and daily loads are maintained from the 7 MGD permit to allow the STP to process peak inflow/infiltration flow rates. That facility was upgraded to 14 MGD to process peak collection system flows. Monthly flow rates still only average 4.4 MGD.

In addition to $CBOD_5$, NH_3-N undergoes biological oxidation in a receiving stream thereby utilizing in stream oxygen and potentially reducing oxygen levels below water quality standards. Ammonia as N is also a pollutant that exhibits toxicity to fish and other aquatic life. The two affects are analyzed separately and the division imposes the most stringent limit in the permit.

b. The treatment facility is required to remove 85% of the $CBOD_5$ and TSS that enter the facility on a monthly basis. This is part of the minimum requirement for all municipal treatment facilities contained in Code of Federal Regulations 40 Part 133.102. The reasons stated by the U.S.E.P.A. for these requirements are to achieve these two basic objectives:

(1) To encourage municipalities to correct excessive inflow and infiltration (I/I) problems in their sanitary sewer systems, and
(2) To help prevent intentional dilution of the influent wastewater as a means of meeting permit limits.

The treatment facility is required to remove 40% of the $CBOD_5$ and TSS that enter the facility on a daily basis. This percent removal will be calculated three times per week and recorded on the Monthly Operation Report. The number of excursions (days when $CBOD_5$ and/or TSS removal is less than 40%) will be reported on the Discharge Monitoring Report.

TSS loads associated with the 7 MGD permit are retained with associated reductions in effluent concentration at 10 MGD for anti-degradation purposes.

6.2. NH_3-N TOXICITY

To access toxicity impacts, the state utilizes the EPA document, 1999 Update to Ambient Water Quality Criteria for Ammonia, pursuant to 0400-40-03-.0-3(3)(j), and assumed stream temperatures of 27°C and 17°C and pH of 8.0 to derive an allowable instream protection value protective of chronic exposure to a continuous discharge. A mass balance equation with sewage treatment facility and stream flows and this allowable value determines the monthly average permit limit. The criteria document states that a 30Q5 flow value is protective in deriving allowable values. Where the division has 30Q5 flow values, the division may use them. Otherwise, the division utilizes the available 7Q10 or 1Q10 values that are generally more conservative. The criteria continuous concentrations (CCC) derived from assumed temperature and pH values are as follows:

CCC values based on temperature and pH, in mg/L:

Temperature (°C)	7.5 pH	8.0 pH
25	2.22	1.24
27	1.94	1.09
30	1.61	0.90

Temperature (°C)	7.5 pH	8.0 pH
15	4.22	2.36
17	3.72	2.07
20	3.06	1.71

The mass balance equation is as follows:

$$CCC = \frac{Q_S C_S + Q_{STP} C_{STP}}{Q_S + Q_{STP}} \qquad \text{or,} \qquad C_{STP=} \frac{CCC(Q_S + Q_{STP}) - (Q_S C_S)}{Q_{STP}}$$

where:

CCC = Criteria continuous concentration (mg/l)
Q_S = 1Q10 flow of receiving stream (MGD)
Q_{STP} = Design flow of STP (MGD)
C_S = Assumed/Measured instream NH_3 (mg/l)
C_{STP} = Allowable STP discharge of NH_3 (mg/l)

$$C_{STP} = \frac{1.09\ (67\ MGD + 10\ MGD) - (67\ MGD \times 0.1 mg/l)}{10\ MGD} = 7.7\ mg/l\ (summer)$$

$$C_{STP} = \frac{2.07\ (67\ MGD + 10\ MGD) - (67\ MGD \times 0.1 mg/l)}{10\ MGD} = 15.3\ mg/l\ (winter)$$

Because the NH_3-N concentration limits calculated to protect dissolved oxygen are more restrictive than the toxicity limits calculated above, the monthly average limit for NH_3-N (1 mg/l-year round) is applied to the permit.

8.3. CHLORINATION

This facility disinfects using ultra-violet radiation, so no chlorine effluent limits or monitoring or reporting conditions are imposed in this permit.

6.4. TOTAL NITROGEN AND TOTAL PHOSPHOROUS LIMITATIONS

For major NPDES permits (design flows $\geq$ 1.0 MGD) EPA recommends continued monitoring for total nitrogen (TN) and total phosphorus (TP) in order to have current nutrient data maintained in its Integrated Compliance Information System (ICIS) database to accurately forecast nutrient loading to the Mississippi River. This ICIS data is being used by the Mississippi Hypoxia Task Force which consists of the EPA and States along the Mississippi River. Tennessee is one of three states in Region 4 which has rivers that ultimately drain to the Mississippi River. Therefore, the permit imposes quarterly monitoring and reporting of total nitrogen for this purpose. The permit imposes more frequent monitoring and reporting and limiting of total phosphorus for anti-degradation purposes. See Section 8.0 and Appendix 5 for additional detail.

6.5. *E. COLI* REQUIREMENTS

Disinfection of wastewater is required to protect the receiving stream from pathogenic microorganisms. Fecal coliform and *E. coli* are indicator organisms used as a measure of bacteriological health of a receiving stream and the effectiveness of disinfection.

As of September 30, 2004, the criterion for fecal coliform has been removed from the State's Water Quality Standards. Thus, the division imposes an *E. coli* limit on discharges of treated sewage for the protection of recreational use of the stream in lieu of the fecal coliform limit. The *E. coli* daily maximum limit of 487 colonies per 100 ml applies to lakes and exceptional Tennessee waters.

6.6. BIOMONITORING

The division evaluates all dischargers for reasonable potential to exceed the narrative water quality criterion, "no toxics in toxic amounts". The division has determined that for municipal facilities with stream dilutions of less than 500 to 1, any of the following conditions may demonstrate reasonable potential to exceed this criterion.

a. Toxicity is suspected or demonstrated.
b. A pretreatment program is required.
c. The design capacity of the facility is greater than 1.0 MGD.

In cases where a discharger has characterized its effluent via toxicity test methods acceptable to the division, reasonable potential to exceed the criterion is evaluated using the following rationale.

EPA's **Technical Support Document for Water Quality Based Toxics Control** (TSD) recommends that the evaluation of both acute and chronic toxicity be based on the number of observations in the data set, the coefficient of variation and an uncertainty factor. The uncertainty factor value is taken from a chart in the technical support document and the coefficient of variation (C.V.) is based on the following numbers.

Less than ten observations C.V. = 0.6
More than ten observations C.V. = Standard Deviation/Mean

The result of each biomonitoring test is converted to toxic units with the equations listed below.

Acute Biomonitoring TUa = $1/LC_{50}$
Chronic Biomonitoring TUc = 1/NOEC or $1/IC_{25}$

The highest numerical value of the acute data set (in TUa) is multiplied by the uncertainty factor (U.F.) and the dilution factor to derive the final acute value. The highest numerical value of the chronic data set (in TUc) is also multiplied by the uncertainty factor and the dilution factor to derive the final chronic value.

Dilution factor = design flow / 7Q10
Final Acute Value = TUa X Uncertainty Factor X Dilution Factor
Final Chronic Value = TUc X Uncertainty Factor X Dilution Factor

The final acute value is compared to the criteria maximum concentration (CMC) for acute toxicity (CMC = 0.3TUa). The CMC is defined as the highest instream concentration of an effluent to which organisms can be exposed to for a brief period of time without causing an acute effect. The final chronic value is compared to the criteria continuous concentration (CCC) for chronic toxicity (CCC = 1.0TUc). The CCC is defined as the highest instream concentration of an effluent to which organisms can be exposed to indefinitely without causing an unacceptable effect. In the absence of chronic data, an acute to chronic ratio (ACR) of 4.4 is assumed (TSD Appendix A.3).

In this case, annual observations of chronic are available. Because the test on water fleas in 2012 exhibited an inhibition concentration for growth/reproduction at less than 13% effluent concentration, reasonable potential exists to exceed the limit. Therefore, the whole effluent toxicity testing frequency will be increased to quarterly. However, the city only has three industrial contributors whose wastewater quality and/or quantity are not suspected to be the cause. Generally, all other whole effluent toxicity tests have passed. Therefore, the reopener clause in Part 1.5 of this permit specifically allows for this permit to be reopened and the frequency reduced after 4 consecutive quarterly results indicate an absence of reasonable potential for toxicity.

The following calculation is the required dilution at which chronic toxicity testing must meet permit requirements.

$$IC_{25}\ \% = \frac{\text{Design Flow}}{\text{Low Flow+ Design Flow}} * 100 \geq \frac{10}{67+10} * 100 > 13\%$$

where:

67	=	Low Flow - 1Q10 (MGD)
10	=	Design Flow Capacity (MGD)
IC_{25}	=	Concentration causing 25% reduction in survival, reproduction and growth of test organisms

6.7. METALS AND TOXICS

Pass-through limitations for heavy metals and other toxic substances have been recalculated as part of the permit issuance process and/or due to changes in industrial waste contribution to the POTW. This POTW is required to implement/maintain a pretreatment program. More frequent monitoring will be required **in the permit** if (a) the reported concentrations approach or exceed calculated allowable values, (b) significant amounts of particular pollutants are present which may impact the treatment process sludge character or the receiving stream, or (c) minimum information is lacking to accurately calculate water quality protection values, in which case additional stream monitoring may also be required.

A summary of the semi-annual report data does not indicate that the potential exists for the water quality criteria for any parameter to be exceeded. Appendix 3 lists the metal and toxic parameters calculations and the procedure used to derive the results.

6.8. VOLATILE ORGANIC, ACID-EXTRACTABLE, AND BASE-NEUTRAL COMPOUNDS

The division evaluated effluent concentrations of volatile organic, acid-extractable, and base-neutral compounds and antimony, arsenic, beryllium, selenium and thallium for potential to violate water quality criteria using the following mass balance equation:

$$Cm = \frac{QsCs + QwCw}{Qs + Qw}$$

where:

Cm	=	resulting in-stream concentration after mixing
Cw	=	concentration of pollutant in wastewater
Cs	=	stream background concentration
Qw	=	wastewater flow, (STP design flow)
Qs	=	stream low flow

to protect water quality:

$$Cw \leq Ca$$

where:

Ca = STP effluent concentration allowable

$$= \frac{(S_A)\,[Cm\,(Qs + Qw) - QsCs]}{Qw}$$

and (S_A) = the percent “Stream Allocation”.

The reasonable potential evaluation uses the following assumptions and procedures:

a. Stream background concentrations, Cs, for all volatile organic, acid-extractable, and base-neutral compounds equal zero unless actual stream data exists to show otherwise. Use of the effluent concentrations of such pollutants contributed by upstream dischargers as background is not justifiable due to the volatility and reactivity of these pollutants.

b. The stream allocation, S_A , is 90% and is used as a factor of safety.

c. A mass balance uses the STP design flow, the receiving stream critical low flow (7Q10 or 1Q10), the state water quality numeric criteria, and the stream allocation safety factor to derive the allowable effluent concentrations.

d. When pollutants have potential to violate standards because the concentrations are below the scan detection levels but could be above the allowable water quality based effluent concentrations, the pollutants are handled one of three (3) ways:

   i. Additional testing of detected and non-detected pollutants is required if contributing industrial processes are likely to contain them and the effluent scans have not met the minimum required detection levels (RDL) in the state water quality standards or approximated the method detection limits (MDL) of the approved test methods for the pollutants in 40 CFR Part 136.
   ii. If the required RDL has been used and resulted in non-detection, or if an MDL has been used with non-detection and the contributing industrial processes do not reasonably contain that pollutant, the division drops the pollutant from further consideration.
   iii. Pollutants detected at levels high enough to violate standards are limited in the permit to the allowable concentration, Cw, based on STP design flow.

Calculations for this permit have been done using a standardized spreadsheet, titled "WQ Based Effluent Calculations- Other Compounds", and are located in Appendix 4. All metals other than antimony, arsenic, beryllium, selenium, and thallium have been evaluated using procedures described in the rationale, or fact sheet, section headed, “METALS & TOXICS”.

The evaluation indicates that volatile organic, acid extractable, and base neutral compounds and antimony, arsenic, beryllium, selenium, and thallium do not exhibit the potential to violate water quality criteria and thus will not be given effluent limitations and monitoring requirements in the permit.

6.9. OVERFLOW AND BYPASS REPORTING

For the purposes of demonstrating proper operation of the collection, transmission, and treatment system, the permit defines overflow as any release of sewage other than through permitted outfalls. This definition includes, but is not necessarily limited to, sanitary sewer overflows and dry weather overflows as defined. For example, a collection system blockage or hydraulic overload that causes backup and release of sewage into a building during a wet weather event may not clearly fit either the definition of a sanitary sewer overflow or a dry weather overflow. Still, any unpermitted release potentially warrants permittee mitigation of human health and/or water quality impacts via direct or indirect contact and demonstrates a hydraulic problem in the system that warrants permittee consideration as part of proper operation and maintenance of the system.

However, for the more typical, unpermitted, releases into the environment, this permit intends interchangeable use of the terms, “overflow” and “sanitary sewer overflow” for compliance reporting purposes.

9. OTHER PERMIT REQUIREMENTS AND CONDITIONS

7.1. CERTIFIED WASTEWATER TREATMENT OPERATOR

The waste treatment facilities shall be operated under the supervision of a Grade IV certified wastewater treatment operator in accordance with the Water Environmental Health Act of 1984. Operator grades are under jurisdiction of the Water and Wastewater Operators Certification Board. This NPDES permit is under jurisdiction of the Tennessee Board of Water Quality, Oil and Gas. Operator grades are rated and recommended by the Division of Water Resources pursuant to Rule 0400-49-01 (formerly 0400-50-03) and are included in this fact sheet for reference. The grades are intentionally not specified in the permit so that the operation certification board can authorize changes in grade without conflicting with this permit.

7.2. COLLECTION SYSTEM CERTIFIED OPERATOR

The collection system shall be operated under the supervision of a Grade II certified collection system operator in accordance with the Water Environmental Health Act of 1984.

7.3. PRETREATMENT PROGRAM

The Columbia STP has an approved pretreatment program. An updated Industrial Waste Survey must be completed within 120 days of the effective date of the permit, unless such a survey has been submitted within 3 years of the effective date.

At least once each reporting period, all permittees with approved pretreatment programs are required to analyze the STP influent and effluent for the following pollutant parameters: chromium (trivalent and hexavalent and total if drinking water use applies), copper, lead, nickel, zinc, silver, cadmium, mercury, total phenols, and cyanide. These pollutants were selected because, historically, they are the ones that tend to be predominant in industrial wastewaters. Other pollutants may be added to the list, as required.

During preparation of this permit, data from ten previous semiannual reports were analyzed. If any particular value of a pollutant equals or exceeds 85% of the pass-through limit, the pollutant was added to the list of those that are required to be sampled. Based on our review of the semiannual reports and other documents, sampling for additional pollutants is not required at this time.

7.4. BIOSOLIDS/SLUDGE MANAGEMENT

The Clean Water Act (CWA) requires that any NPDES permit issued to a publicly owned treatment works or any other treatment works treating domestic sewage shall comply with 40 CFR Part 503, the federal regulation governing the use and disposal of sewage sludge. It is important to note that “biosolids” are sewage sludge that has been treated to a level so that they can be land applied.

The language in subpart 3.3 of the permit, relative to biosolids management, a CWA requirement, allows the “permitting authority” under 40 CFR Part 503.9(p) to be able to enforce the provisions of Part 503. The “permitting authority” relative to Part 503 is either a state that has been delegated biosolids management authority or the applicable EPA Region; in the case of Tennessee it is EPA-Region 4.

Tennessee regulates the land application of biosolids under state rules, Chapter 0400-40-15. The state rules became effective on June 30, 2013. Under these state rules, all facilities that land apply biosolids must obtain a biosolids permit from the division. The land application of biosolids under state rules will be regulated through either a general permit or by an individual permit. It is anticipated that the permitting of biosolids land application will begin near the beginning of calendar year 2014. Questions about the division’s biosolids regulations and permitting program should be directed to the division’s Biosolids Coordinator at:

State of Tennessee
Department of Environment and Conservation
Division of Water Resources
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor

Nashville, Tennessee 37243-1102
(615) 532-0625

7.5. PERMIT TERM

This permit is being reissued for 4 years in order to coordinate its reissuance with other permits located within the Duck-Lower Watershed.

10. ANTIDEGRADATION STATEMENT/WATER QUALITY STATUS

Tennessee's Antidegradation Statement is found in the Rules of the Tennessee Department of Environment and Conservation, Chapter 0400-40-03-.06. It is the purpose of Tennessee's standards to fully protect existing uses of all surface waters as established under the Act.

Stream determinations for this permit action are associated with the waterbody segment identified by the division as segment ID# TN06040003026_1000.

The division has made a determination of the receiving waters associated with the subject discharge(s) and has found the (stream or river) to be a high quality water. No permanent degradation of water quality will be allowed unless the applicant demonstrates to the Water Quality Control Board that the degradation is for necessary economic or social development and will not interfere with or become injurious to any existing uses. The specific requirements for this demonstration are described in the Rules of the Tennessee Department of Environment and Conservation, Chapter 0400-40-03-.06(4).

Additionally, the division assessed this water in 2005 as not supporting its designated uses due to low dissolved oxygen and elevated levels of total phosphorus. The oxygen demanding pollutants ($CBOD_5$ and ammonia) are limited in accordance with division modeling to be protective of the state's water quality standard for dissolved oxygen. The permit also imposes limits to prevent the POTW effluent from contributing additional phosphorus loading as required of the anti-degradation provision of the state water quality standards (0400-40-05-.06). Specific details and rationale are provided in Appendix 5. Additionally, a reopener clause is added to Part 1.5 of the permit allowing for the permit to be reopened and modified, subject to permittee comment and appeal and applicable public notice procedures, to incorporate changes necessary to accommodate watershed planning requirements associated with total maximum daily load (TMDL) development or other pollutant reduction strategy for nutrients by either the permittee or the State of Tennessee.

No wasteload allocations have been established for the Duck River in Maury County via TMDLs at this time.

On November 20, 2013, division staff met with the permittee and their design consultant for a tour of the facility and to discuss upcoming permit issues. The discussion concluded that there is no feasible option available for disposing of wastewater other than direct discharge at this time.

APPENDIX 1 – ENFORCEABLE PREVIOUS PERMIT LIMITS

PARAMETERS	MONTHLY AVERAGE CONCENTRATION (MG/L)	MONTHLY AVERAGE AMOUNT (LB/DAY)	WEEKLY AVERAGE CONCENTRATION (MG/L)	WEEKLY AVERAGE AMOUNT (LB/DAY)	DAILY MAXIMUM CONCENTRATION (MG/L)	DAILY MINIMUM PERCENT REMOVAL	MEASUREMENT FREQUENCY
$CBOD_5$	25	1460	35	2043	40	40	5/week
NH_3-N	5.0	292	7.5	438	10	—	5/week
Total Suspended Solids	21	1751	28	2335	31	40	5/week
Dissolved Oxygen (mg/l)	6.0 (daily minimum) instantaneous	—	—	—	—	—	5/week
Total Nitrogen							
Effluent	—	—	—	—	Report (qtr avg)	Report (qtr load)	1/quater
Total Phosphorous							
Influent	—	—	—	—	Report (qtr avg)	Report (qtr load)	1/quater
Effluent	—	—	—	—	Report (qtr avg)	Report (qtr load)	1/quater
E. coli (colonies/100ml)	126/100 ml	—	—	—	487/100	—	5/week
Settleable Solids (ml/l)	—	—	—	—	1.0 (daily maximum)	—	5/week
pH (standard units)	6.0-9.0	—	—	—	—	—	5/week
Flow (MGD):							
Influent	Report	—	—	—	Report	—	7/week
Effluent	Report	—	—	—	Report	—	7/week
Whole Effluent Toxicity:							
IC_{25}	13% per sample	—	—	—	—	—	1/year
Sanitary Sewer Overflows, Total Occurrences			Report				continuous
Dry Weather Overflows, Total Occurrences			Report				continuous
Bypass of Treatment, Total Occurrences			Report				continuous

APPENDIX 2 – DISCHARGE MONITORING REPORT SUMMARY

Columbia STP, Permit No. TN0056103

Outfall 001G

Issued	9/30/2009
Effective	11/1/2009
Expiration	9/30/2013

Legend:
NODI=B = Below Detection Limit/No Detection
NODI=9 = Conditional Monitoring - Not Required

Parameter	CBOD5	CBOD5	CBOD5 % Removal
Sample Type	Composite	Composite	Composite
Analysis Frequency	5/Week	5/Week	5/Week
Sampling Point	Effluent Gross	Influent	% Removal

Limit Unit Desc	mg/L	lb/day	mg/L	lb/day	mg/L	mg/L	mg/L	Percent	Percent
Statistical Base	MO AVG	MO AVG	WKLY AVG	WKLY AVG	DAILY MX	MO AVG	DAILY MX	DAILY MN	MO AV MN
08/31/2010	4	93.3	4.7	113.9	9.9	126.7	200	88.5	96.4
09/30/2010	3.9	61	4.2	82.9	7.5	173.1	275	95.5	97.6
10/31/2010	4.1	84.7	4.8	105.7	4.6	161.2	219	93.3	97.4
11/30/2010	3.6	102.9	3.7	138.2	6.6	143.9	215	94.3	97.4
12/31/2010	5.1	215.6	4.7	218.4	17.1	121.1	280	86.9	95
01/31/2011	4.8	157.8	5.7	190.5	7.5	137.6	310	91.9	96.2
02/28/2011	5.8	273.4	6.4	462.8	12.3	141.2	211.7	85.8	95.3
03/31/2011	5.8	289.2	7.2	341.3	15.6	149.7	315	83.9	95.4
04/30/2011	5.6	371.3	6.5	498.4	13.8	136.9	330	90	95.5
05/31/2011	2.7	130.5	3.2	303.8	4.6	133.9	430.8	92.6	97.6
06/30/2011	3.8	111.8	4.3	140.4	7.2	166.6	246.2	89	97.4
07/31/2011	4.2	119.4	4.9	166.6	9	157.9	256.1	94.1	97.1
08/31/2011	3.2	73.1	3.2	75.9	7.9	137.7	225	94.9	98.6
09/30/2011	2.8	100.1	3.5	172.1	5.1	100.3	161.5	90.1	96.6
10/31/2011	2.8	54.8	3.3	68.5	5.9	137.2	176.4	95.9	97.9
11/30/2011	2.8	92.9	3.3	135.9	5.4	130.8	215.4	92.6	97.6
12/31/2011	2.5	153.1	2.8	199.4	4.2	79.7	133.5	92.3	96.3
01/31/2012	3	156.5	3.8	309.7	6	84.6	138.5	90	96.1
02/29/2012	3.2	148.3	4.5	247.1	6.5	85.1	140.6	92.4	96.2
03/31/2012	4.2	164.8	4.6	217.1	7.8	132.1	257.7	88.9	96.3
04/30/2012	6.3	142.6	7.5	172.6	15.3	183	160	91.6	96
05/31/2012	3.2	82.2	3	117.4	5.9	150.2	307.7	95.4	97.7
06/30/2012	3.4	71	3.6	81.4	5	151.5	242.5	96.8	97.7
07/31/2012	2.6	72.3	3.1	85	5.9	149.4	210.9	95.2	98.2
08/31/2012	2.8	69.9	2.9	82	5.9	148.1	307.6	96.2	97.9
09/30/2012	2.4	90.3	2.8	176.5	6.3	111	199.9	96.2	97.6
10/31/2012	3.1	114	3.4	132.5	6.6	104.8	220	90.6	96.6
11/30/2012	4.2	101.1	4.1	104.3	9	126.5	238	92.8	96.5
12/31/2012	3.2	184.7	3.7	295.4	6	115.8	265.4	84.8	96.3
01/31/2013	3.9	284.9	5.2	428	8.4	79.7	300	86.2	93.9
02/28/2013	4.3	201.3	5	275.1	6.2	101.8	154.4	90.3	95.5
03/31/2013	3.7	150.4	4.1	210.6	6.4	109.2	162.5	90.5	96.3
04/30/2013	4.3	262.2	5.2	316.6	9.6	91.1	169.2	88.1	94.8
05/31/2013	4	172.1	4.3	233.6	6.1	113.3	246.9	90.9	95.8
06/30/2013	4.5	140.7	10.6	191.2	6.9	160.5	260	90.1	96.8
07/31/2013	3.6	103.9	4.5	123.2	9.8	120.1	210	92	96.9
08/31/2013	5.4	143.3	6.9	178.1	9.8	131.8	230	91.7	95.5
09/30/2013	4.2	105	5.2	129.9	8.1	120.6	242.2	91.4	96.2

Limit Value	25	1460	35	2043	40	Report	Report	40	85
Standard Dev.	1.01	73	1.60	109	3.2	26	63	3.3	1.0
Minimum	2.40	55	2.80	69	4.2	80	134	83.9	93.9
Maximum	6.30	371	10.60	498	17.1	183	431	96.8	98.6
Average	3.87	143	4.59	198	7.9	129	233	91.4	96.6
Count	38	38	38	38	38	38	38	38	38
No. of Exceed.	0	0	0	0	0	--	--	0	0

Parameter	Ammonia as N					TSS				
Sample Type	Composite					Composite				
Analysis Frequency	5/Week					5/Week				
Sampling Point	Effluent Gross					Effluent Gross				

Limit Unit Desc	mg/L	lb/day	mg/L	lb/day	mg/L	mg/L	lb/day	mg/L	lb/day	mg/L
Statistical Base	MO AVG	MO AVG	WKLY AVG	WKLY AVG	DAILY MX	MO AVG	MO AVG	WKLY AVG	WKLY AVG	DAILY MX
08/31/2010	0.16	3.9	0.22	5.1	0.65	5.5	135.8	10.4	235.4	27
09/30/2010	0.18	3.2	0.28	5.7	0.91	5.1	68.2	5.1	87.3	12
10/31/2010	0.15	3.3	0.26	5.5	0.93	4	79.2	4.7	94.2	10
11/30/2010	0.11	3.8	0.22	10.5	0.78	3.6	130	5.8	297.5	17
12/31/2010	0.13	8	0.15	10	0.8	4	214.9	4.7	274.7	12
01/31/2011	0.08	2.7	0.09	3.6	0.34	3.7	125.7	4.7	188.3	8
02/28/2011	0.38	21.6	0.5	37.4	1.41	6.5	335.4	9.7	709.3	20
03/31/2011	0.28	11.8	0.41	12.4	1.17	5.2	269.9	6.5	478.2	13
04/30/2011	0.72	44	1.08	69	2.34	5.8	493.7	8.3	1127.5	13
05/31/2011	0.11	5.9	0.16	16.6	0.29	3	137.4	3.7	297.2	14
06/30/2011	0.29	12.4	0.27	8.6	2.9	6.5	212.8	10	347.8	16
07/31/2011	0.23	5.8	0.43	10.3	0.86	5.3	146	5.8	194.3	12
08/31/2011	0.15	3.3	0.17	3.5	0.3	2.2	49.8	1.8	4.4	7
09/30/2011	0.17	5.8	0.19	9.1	0.33	4	1446.5	4.9	252.7	11
10/31/2011	0.16	3	0.17	3.2	0.29	3.4	65.3	4.2	78.1	6
11/30/2011	0.18	5.5	0.23	7.7	0.53	3.5	121.5	5	226.5	8
12/31/2011	0.25	14.6	0.29	19.9	0.97	3.5	216.8	5.2	362.8	10
01/31/2012	0.16	9.3	0.23	15.6	0.86	2.2	120.6	2.7	220.2	5
02/29/2012	0.22	10.5	0.51	27.7	1.74	3.7	167.1	4.5	240.4	8
03/31/2012	0.65	24.1	1.24	35.2	2.81	4.5	178.3	6	278.6	12
04/30/2012	2.11	47.5	5.37	115.7	**11.7**	7	162.1	9.3	203.5	13
05/31/2012	0.33	8.7	0.26	10.9	0.72	6.6	174.1	7.7	268.2	13
06/30/2012	0.29	6.1	0.3	6.3	0.48	6.8	145.7	13.2	169.8	15
07/31/2012	0.25	7.1	0.33	11.5	0.48	3.1	89.2	4.2	151.4	7
08/31/2012	0.37	9.1	0.46	11.2	0.99	3.8	101.3	4.8	131.9	9
09/30/2012	0.35	13.5	0.51	23.7	1.2	4.6	171.7	5.5	340.1	13
10/31/2012	0.3	11.9	0.48	21.9	1.32	3.6	134.7	4.5	209.9	8
11/30/2012	0.29	6.8	0.34	8	0.51	3.9	97.5	3.8	111	10
12/31/2012	0.38	25.6	0.58	45.8	1.82	4.4	258.4	5.8	419.4	13
01/31/2013	0.33	24.6	0.34	33.3	1.06	4.1	318.1	4.2	457.4	14
02/28/2013	0.21	9.7	0.26	12	0.48	3.5	162.5	4.2	226.7	7
03/31/2013	0.31	12.5	0.33	17.8	0.46	3.4	144.7	4.8	209.5	8
04/30/2013	0.91	54.1	1.7	103.7	3.9	4.4	303.7	5.3	365.8	12
05/31/2013	0.26	11.6	0.3	15.1	0.51	4.7	208.4	6.2	309.7	9
06/30/2013	0.42	14.4	0.65	28.5	1.62	3.4	102.7	4	117	8
07/31/2013	0.18	5.9	0.18	7.3	0.6	2.3	80	3.4	175.3	8
08/31/2013	0.35	9.1	0.65	15	2.17	2.7	71.6	2.6	83.1	7.6
09/30/2013	0.33	8.1	0.44	9.4	0.68	3	71.2	3.7	89.5	5.8

Limit Value	5.0	292	7.5	438	10	21	1751	28	2335	31
Standard Dev.	0.34	12.20	0.86	25.04	1.91	1.3	227	2.4	197	4.3
Minimum	0.08	2.70	0.09	3.20	0.29	2.2	50	1.8	4	5.0
Maximum	2.11	54.10	5.37	115.70	11.70	7.0	1447	13.2	1128	27.0
Average	0.34	12.86	0.54	21.41	1.37	4.2	198	5.6	264	11.1
Count	38	38	38	38	38	38	38	38	38	38
No. of Exceed.	0	0	0	0	1	0	0	0	0	0

Parameter	TSS	TSS % Removal	E. Coli	Settleable Solids
Sample Type	Composite	Composite	Grab	Grab
Analysis Frequency	5/Week	5/Week	5/Week	5/week
Sampling Point	Influent	% Removal	Effluent Gross	Effluent Gross

Limit Unit Desc	mg/L	mg/L	Percent	Percent	#/100 ml	#/100 ml	Milliliters per Liter
Statistical Base	MO AVG	DAILY MX	DAILY MN	MO AV MN	MO GEOMN	DAILY MX	DAILY MX
08/31/2010	169.9	362	81.5	95.8	14	312	0.1
09/30/2010	221.2	436	93.5	97.5	32	460	0.1
10/31/2010	191	276	93.5	97.8	5	216	0.1
11/30/2010	190.5	398	95.2	98.2	10	520	0.1
12/31/2010	156.1	390	90	97.1	4	188	0.1
01/31/2011	191.9	312	95.3	97.9	11	83	0.1
02/28/2011	194.3	364	88.5	96.5	5	26	0.1
03/31/2011	178.3	404	91.8	96.6	4	44	0.1
04/30/2011	179.6	512	88.4	96.3	4	36	0.1
05/31/2011	183.1	370	94.6	98.2	2	26	0.1
06/30/2011	239	414	92.3	97.3	7	67	0.1
07/31/2011	237.5	552	93.5	97.5	8	192	0.1
08/31/2011	155.9	250	94.1	97.7	2	28	NODI=B
09/30/2011	136.3	190	81	96.6	6	44	0.1
10/31/2011	167.2	240	96.3	98	6	82	NODI=B
11/30/2011	157.1	238	93.7	97.7	13	135	0.1
12/31/2011	116.4	208	88.6	96.6	10	107	0.1
01/31/2012	117.9	232	90	97.5	9	130	0.1
02/29/2012	146.3	306	93.9	97.2	5	26	0.1
03/31/2012	168.9	388	88.1	96.4	11	54	0.1
04/30/2012	211.3	552	85.9	95.9	15	195	0.1
05/31/2012	215.5	418	88.9	96.6	12	56	0.1
06/30/2012	236.1	548	93.3	96.8	19	82	0.1
07/31/2012	228.8	402	94.7	98.4	41	184	NODI=B
08/31/2012	200.9	438	91.9	97.7	32	200	0.1
09/30/2012	191.4	464	93.4	97.5	21	312	0.1
10/31/2012	175.5	356	91.9	97.5	15	556	0.1
11/30/2012	180.4	372	93.3	97.6	38	408	0.1
12/31/2012	176.4	500	94.2	97.3	20	264	NODI=B
01/31/2013	128.3	356	83.3	95.8	14	45	0.1
02/28/2013	144	278	94.8	97.4	23	115	NODI=B
03/31/2013	153.9	420	94.7	97.7	16	164	0.1
04/30/2013	173.6	466	80	96.5	6	45	0.1
05/31/2013	150	266	88.1	96.3	20	58	NODI=B
06/30/2013	180.4	304	95	98	15	156	0.1
07/31/2013	126.5	228	63.6	96.5	16	480	0.1
08/31/2013	191.4	452	94.7	98.4	14	101	0.1
09/30/2013	74.1	176	80	94.8	30	177	0.1

Limit Value	Report	Report	40	85	126	487	1.0
Standard Dev.	36	104	6.4	0.8	9.9	148.2	0.0
Minimum	74	176	63.6	94.8	2.0	26.0	0.1
Maximum	239	552	96.3	98.4	41.0	556.0	0.1
Average	175	364	90.1	97.1	14.1	167.7	0.1
Count	38	38	38	38	38	38	32
No. of Exceed.	--	--	0	0	0	2	0

Parameter	Dissolved Oxygen (DO)	pH		Flow		Flow	
Sample Type	Grab	Grab		Continuous		Continuous	
Analysis Frequency	5/week	5/week		7/week		7/week	
Sampling Point	Effluent Gross	Effluent Gross		Effluent Gross		Influent	

Limit Unit Desc	mg/L	S.U.	S.U.	MGD	MGD	MGD	MGD
Statistical Base	INST MIN	MINIMUM	MAXIMUM	MO AVG	DAILY MX	MO AVG	DAILY MX
08/31/2010	7.2	7.9	8.4	3.1354	8.9829	4.548	12.0833
09/30/2010	7.8	7.9	8.3	1.8844	3.0659	3.308	4.1089
10/31/2010	8.4	7.9	8.3	2.5862	5.4688	3.2636	6.6447
11/30/2010	7.5	8	8.4	3.2596	7.5234	4.0382	9.419
12/31/2010	9.1	7.6	8.5	5.1629	15.8189	5.9916	17.6012
01/31/2011	8	8.1	8.4	4.1089	7.9163	5.0162	8.6603
02/28/2011	8.1	7.5	8.4	5.1518	14.4619	5.7777	15.3307
03/31/2011	8.1	7.5	8.4	6.2333	11.0799	6.6935	11.0817
04/30/2011	8	7.5	8.5	8.1045	20.4074	8.8203	21.5873
05/31/2011	8.1	7.3	8.4	5.8306	15.8517	6.4285	16.9913
06/30/2011	8.1	7.8	8.4	3.2879	8.1083	3.8478	9.73
07/31/2011	7.2	7.7	8.3	3.2524	5.1416	4.1778	7.7464
08/31/2011	6.7	7.8	8.1	2.656	3.475	3.3063	4.125
09/30/2011	7.7	7.6	8.4	3.9701	10.4166	4.603	11.0651
10/31/2011	8.5	7.6	8.2	2.2679	2.96	3.0491	4.0636
11/30/2011	9.1	6.9	8.4	3.716	10.95	4.566	11.81
12/31/2011	9.6	7.1	8.2	7.1526	11.88	7.6718	12.22
01/31/2012	9.1	6.9	8.2	6.2887	12.36	8.0323	15.25
02/29/2012	9.9	7.2	8.1	5.3166	7.17	6.3248	8.8
03/31/2012	8.6	7.1	8.3	4.8852	4.18	6.1103	10.88
04/30/2012	7.7	7	8	2.792	3.87	4.0067	4.88
05/31/2012	7.2	7.6	8.3	3.2061	7.29	4.6803	9.3
06/30/2012	7.9	7.4	8.2	2.5057	3.78	3.766	5.15
07/31/2012	7.6	7.5	8.1	3.4258	8.82	4.6403	10.56
08/31/2012	7.5	7.6	8.1	2.9584	6.66	4.2526	8.41
09/30/2012	7.5	7.6	8.3	4.017	11.34	5.2993	13.45
10/31/2012	8.4	7.2	8.3	4.3467	8.07	5.7529	10.56
11/30/2012	8.2	7	8.2	2.7399	4.32	4.1463	5.9
12/31/2012	8.8	7.5	8.3	6.7045	14.55	8.2442	16.87
01/31/2013	10	7.6	8.5	8.8035	14.91	10.4219	17.63
02/28/2013	10	7.2	8.3	5.5512	10.41	6.8622	12.08
03/31/2013	10	7.9	8.4	4.7105	9.84	6.002	11.33
04/30/2013	9.6	7.6	8.3	7.0389	15.6947	8.4782	17.7227
05/31/2013	8.5	8	8.3	5.3254	12.72	6.7029	15.38
06/30/2013	8.1	8	8.3	3.4073	6.39	4.7648	7.7
07/31/2013	7.5	8.2	8.3	3.9021	10.74	5.2614	12.23
08/31/2013	7.7	7.8	8.4	3.1277	4.56	4.3068	5.74
09/30/2013	7.8	8	8.3	2.9277	5.13	4.1313	6.39

Limit Value	6.0	6.0	9.0	Report	Report	Report	Report
Standard Dev.	0.9	0.4	0.1	1.71	4.36	1.76	4.46
Minimum	6.7	6.9	8.0	1.88	2.96	3.05	4.06
Maximum	10.0	8.2	8.5	8.80	20.41	10.42	21.59
Average	8.3	7.6	8.3	4.36	9.11	5.46	10.80
Count	38	38	38	38	38	38	38
No. of Exceed.	0	0	0	--	--	--	--

Parameter	IC25: Ceriodaphnia	IC25: Pimephales	Overflow Use	Overflow Use	Bypass	Bypass
Sample Type	Composite	Composite	Visual	Visual	Visual	Visual
Analysis Frequency	1/Quarter	1/Quarter	Continuous	Continuous	Continuous	Continuous
Sampling Point	Effluent Gross	Effluent Gross	Wet Weather	Dry Weather	Wet Weather	Dry Weather
Limit Unit Desc	Percent	Percent	#/Month	#/Month	#/Month	#/Month
Statistical Base	MINIMUM	MINIMUM	MO TOTAL	MO TOTAL	MO TOTAL	MO TOTAL
08/31/2010	NODI=9	NODI=9	2	1	0	0
09/30/2010	NODI=9	NODI=9	2	0	0	0
10/31/2010	NODI=9	NODI=9	1	0	0	0
11/30/2010	13	13	0	4	0	0
12/31/2010	NODI=9	NODI=9	4	0	0	0
01/31/2011	NODI=9	NODI=9	2	0	0	0
02/28/2011	NODI=9	NODI=9	3	1	0	0
03/31/2011	NODI=9	NODI=9	5	0	0	0
04/30/2011	NODI=9	NODI=9	1	5	0	0
05/31/2011	NODI=9	NODI=9	2	0	0	0
06/30/2011	NODI=9	NODI=9	2	0	0	0
07/31/2011	NODI=9	NODI=9	0	0	0	0
08/31/2011	NODI=9	NODI=9	0	0	0	0
09/30/2011	NODI=9	NODI=9	1	0	0	0
10/31/2011	52	52	2	0	0	0
11/30/2011	NODI=9	NODI=9	1	0	0	0
12/31/2011	NODI=9	NODI=9	3	0	0	0
01/31/2012	NODI=9	NODI=9	2	0	0	0
02/29/2012	NODI=9	NODI=9	1	0	0	0
03/31/2012	NODI=9	NODI=9	2	0	0	0
04/30/2012	NODI=9	NODI=9	3	0	0	0
05/31/2012	NODI=9	NODI=9	1	0	0	0
06/30/2012	NODI=9	NODI=9	0	0	0	0
07/31/2012	NODI=9	NODI=9	1	0	0	0
08/31/2012	NODI=9	NODI=9	3	0	0	0
09/30/2012	NODI=9	NODI=9	1	0	0	0
10/31/2012	13	13	0	0	0	0
11/30/2012	13	NODI=9	0	0	0	0
12/31/2012	NODI=9	NODI=9	2	1	0	0
01/31/2013	NODI=9	NODI=9	2	1	0	0
02/28/2013	NODI=9	NODI=9	1	1	0	0
03/31/2013	NODI=9	NODI=9	2	0	0	0
04/30/2013	NODI=9	NODI=9	4	1	0	0
05/31/2013	NODI=9	NODI=9	0	0	0	0
06/30/2013	NODI=9	NODI=9	0	0	0	0
07/31/2013	NODI=9	NODI=9	0	0	0	0
08/31/2013	NODI=9	NODI=9	1	0	0	0
09/30/2013	13	13	1	0	0	0
Limit Value	13	13	Report	Report	Report	Report
Standard Dev.	17	20	1.267831562	1.05368013	0	0
Minimum	13	13	0	0	0	0
Maximum	52	52	5	5	0	0
Average	21	23	1.526315789	0.39473684	0	0
Count	5	4	38	38	38	38
No. of Exceed.	0	0	58	15	0	0

APPENDIX 3 – METAL AND TOXIC PARAMETER CALCULATIONS

The following procedure is used to calculate the allowable instream concentrations for pass-through guidelines and permit limitations.

a. The most recent background conditions of the receiving stream segment are compiled. This information includes:

   * 1Q10 of receiving stream (67 MGD, USGS)
   * Calcium hardness (161 mg/l, default)
   * Total suspended solids (16 mg/l, default)
   * Background metals concentrations (ambient, ½ water quality criteria)
   * Other dischargers impacting this segment (none)
   * Downstream water supplies, if applicable

b. The chronic water quality criteria are converted from total recoverable metal at lab conditions to dissolved lab conditions for the following metals: cadmium, copper, trivalent chromium, lead, nickel and zinc. Then translators are used to convert the dissolved lab conditions to total recoverable metal at ambient conditions.

c. The acute water quality criteria are converted from total recoverable metal at lab conditions to dissolved lab conditions for the following metals: cadmium, copper, trivalent chromium, lead, nickel, zinc and silver. Then translators are used to convert the dissolved lab conditions to total recoverable metal at ambient conditions for the following metals: cadmium, copper, lead, nickel and silver.

d. The resulting allowable trivalent and hexavalent chromium concentrations are compared with the effluent values characterized as total chromium on permit applications. If reported total chromium exceeds an allowable trivalent or hexavalent chromium value, then the calculated value will be applied in the permit for that form of chromium unless additional effluent characterization is received to demonstrate reasonable potential does not exist to violate the applicable state water quality criteria for chromium.

e. A standard mass balance equation determines the total allowable concentration (permit limit) for each pollutant. This equation also includes a percent stream allocation of no more than 90%.

The following formulas are used to evaluate water quality protection:

$$Cm = \frac{QsCs + QwCw}{Qs + Qw}$$

where:

Cm = resulting in-stream concentration after mixing
Cw = concentration of pollutant in wastewater
Cs = stream background concentration
Qw = wastewater flow
Qs = stream low flow

to protect water quality:

$$Cw \leq \frac{(S_A)\,[Cm\,(Qs + Qw) - QsCs]}{Qw}$$

where (S_A) is the percent “Stream Allocation”.

Calculations for this permit have been done using a standardized spreadsheet, titled "Water Quality Based Effluent Calculations." Division policy dictates the following procedures in establishing these permit limits:

1. The critical low flow values are determined using USGS data:

   Fish and Aquatic Life Protection
   7Q10 - Low flow under natural conditions
   1Q10 - Regulated low flow conditions

   Other than Fish and Aquatic Life Protection
   30Q2 - Low flow under natural conditions

2. Fish & Aquatic Life water quality criteria for certain Metals are developed through application of hardness dependent equations. These criteria are combined with dissolved fraction methodologies in order to formulate the final effluent concentrations.

3. For criteria that are hardness dependent, chronic and acute concentrations are based on a Hardness of 25 mg/L and Total Suspended Solids (TSS) of 10 mg/L unless STORET or Water Supply intake data substantiate a different value. Minimum and maximum limits on the hardness value used for water quality calculations are 25 mg/L and 400 mg/L respectively. The minimum limit on the TSS value used for water quality calculations is 10 mg/L.

4. Background concentrations are determined from the division database, results of sampling obtained from the permittee, and/or obtained from nearby stream sampling data. If this background data is not sufficient, one-half of the chronic “In-stream Allowable” water quality criteria for fish and aquatic life is used. If the measured background concentration is greater than the chronic “In-stream Allowable” water quality criteria, then the measured background concentration is used in lieu of the chronic “In-stream Allowable” water quality criteria for the purpose of calculating the appropriate effluent limitation (Cw). Under these circumstances, and in the event the “stream allocation” is less than 100%, the calculated chronic effluent limitation for fish and aquatic life should be equal to the chronic “In-stream Allowable” water quality criteria. These guidelines should be strictly followed where the industrial source water is not the receiving stream.

Where the industrial source water is the receiving stream, and the measured background concentration is greater than the chronic “In-stream Allowable” water quality criteria, consideration may be given as to the degree to which the permittee should be required to meet the requirements of the water quality criteria in view of the nature and characteristics of the receiving stream.

The spreadsheet has fifteen (15) data columns, all of which may not be applicable to any particular characteristic constituent of the discharge. A description of each column is as follows:

Column 1: The "Stream Background" concentrations of the effluent characteristics.

Column 2: The "Chronic" Fish and Aquatic Life Water Quality criteria. For cadmium, copper, trivalent chromium, lead, nickel, and zinc, this value represents the criteria for the dissolved form at laboratory conditions. The Criteria Continuous Concentration (CCC) is calculated using the equation:

$$CCC = (\exp \{ m_C [\ln (\text{stream hardness})] + b_C \}) (CCF)$$

CCF = Chronic Conversion Factor

This equation and the appropriate coefficients for each metal are from Tennessee Rule 0400-40-03-.03 and the EPA guidance contained *in The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From a Dissolved Criterion* (EPA 823-B-96-007, June 1996). Values for other metals are in the total form and are not hardness dependent; no chronic criterion exists for silver. Published criteria are used for non-metal parameters.

Column 3: The "Acute" Fish and Aquatic Life Water Quality criteria. For cadmium, copper, trivalent chromium, lead, nickel, silver, and zinc, this value represents the criteria for the dissolved form at laboratory conditions. The Criteria Maximum Concentration (CMC) is calculated using the equation:

$$CMC = (\exp \{ m_A [\ln (\text{stream hardness})] + b_A \}) (ACF)$$

ACF = Acute Conversion Factor

This equation and the appropriate coefficients for each metal are from Tennessee Rule 0400-40-03-.03 and the EPA guidance contained in *The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From a Dissolved Criterion* (EPA 823-B-96-007, June 1996). Values for other metals are in the total form and are not hardness dependent. Published criteria are used for non-metal parameters.

Column 4: The “Fraction Dissolved” converts the value for dissolved metal at laboratory conditions (columns 2 & 3) to total recoverable metal at in-stream ambient conditions (columns 5 & 6). This factor is calculated

using the linear partition coefficients found in *The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From a Dissolved Criterion* (EPA 823-B-96-007, June 1996) and the equation:

$$\frac{C_{diss}}{C_{total}} = \frac{1}{1 + \{ [K_{po}] [ss^{(1+a)}] [10^{-6}] \}}$$

ss = in-stream suspended solids concentration [mg/l]

Linear partition coefficients for streams are used for unregulated (7Q10) receiving waters, and linear partition coefficients for lakes are used for regulated (1Q10) receiving waters. For those parameters not in the dissolved form in columns 2 & 3 (and all non-metal parameters), a Translator of 1 is used.

Column 5: The "Chronic" Fish and Aquatic Life Water Quality criteria at in-stream ambient conditions. This criteria is calculated by dividing the value in column 2 by the value in column 4.

Column 6: The "Acute" Fish and Aquatic Life Water Quality criteria at in-stream ambient conditions. This criteria is calculated by dividing the value in column 3 by the value in column 4.

Column 7: The "Chronic" Calculated Effluent Concentration for the protection of fish and aquatic life. This is the chronic limit.

Column 8: The "Acute" Calculated Effluent Concentration for the protection of fish and aquatic life. This is the acute limit.

Column 9: The In-Stream Water Quality criteria for the protection of Human Health associated with the stream use classification of Organism Consumption (Recreation).

Column 10: The In-Stream Water Quality criteria for the protection of Human Health associated with the stream use classification of Water and Organism Consumption. These criteria are only to be applied when the stream use classification for the receiving stream includes both “Recreation” and “Domestic Water Supply.”

Column 11: The In-Stream Water Quality criteria for the protection of Human Health associated with the stream use classification of Domestic Water Supply.

Column 12: The Calculated Effluent Concentration associated with Organism Consumption.

Column 13: The Calculated Effluent Concentration associated with Water and Organism Consumption.

Column 14: The Calculated Effluent Concentration associated with Domestic Water Supply.

Column 15: The Effluent Limited criteria. This upper level of allowable pollutant loading is established if (a) the calculated water quality value is greater than accepted removal efficiency values, (b) the treatment facility is properly operated, and (c) full compliance with the pretreatment program is demonstrated. This upper level limit is based upon EPA's 40 POTW Survey on levels of metals that should be discharged from a POTW with a properly enforced pretreatment program and considering normal coincidental removals.

The most stringent water quality effluent concentration from Columns 7, 8, 12, 13, 14, and 15 is applied if the receiving stream is designated for domestic water supply. Otherwise, the most stringent effluent concentration is chosen from columns 7, 8, 12, and 15 only.

WQ Based Effluent Calculations

PASS-THROUGH LIMITATIONS FOR METALS AND OTHER TOXIC SUBSTANCES
WATER QUALITY BASED EFFLUENT CALCULATIONS
OUTFALL 001

FACILITY:	PERMIT #:	DATE:	CALC BY:
Columbia STP	TN0056103	9/10/2013	AEWF

regulated stream worksheet (1Q10)

Stream (1Q10) [MGD]	Stream (30Q5) [MGD]	Waste Flow [MGD]	Ttl. Susp. Solids [mg/l]	Hardness (as CaCO3) [mg/l]	Margin of Safety [%]
67.000	100.000	10.000	16	161	50

Cadmium stream background data from 2009 through 2012 only

Stream is non-wadeable, allocation factor is 50%

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Stream	Fish/Aqua. Life (F & AL) WQC			F & AL- instream allowable		Calc. Effluent Concentration		Human Health Water Quality Criteria *						effluent	
Bckgmd.	lab conditions		Fraction	ambient conditions (Tot)		based on F & AL		In-Stream Criteria			Calc. Effluent Concentration **			limited	
Conc.	Chronic	Acute	Dissolved	Chronic	Acute	Chronic	Acute	Organisms	Water/Organisms	DWS	Organisms	Water/Organisms	DWS	case	
[ug/l]	[ug/l]	[ug/l]	[Fraction]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	ug/l	PARAMETER
2.520	13.453	21.050	0.210	64.047	100.208	**238.14**	**377.36**	N/A	N/A	N/A	**NA**	NA	NA	**80.0**	**Copper (a,b)**
1.240	109.470	841.560	0.057	1926.393	14809.359	**7412.46**	**57011.88**	N/A	N/A	N/A	**NA**	NA	NA		**Chromium III**
1.240	11.000	16.000	1.000	11.000	16.000	**38.20**	**57.45**	N/A	N/A	N/A	**NA**	NA	NA		**Chromium VI**
1.240	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.0	**NA**	NA	543.80	**60.0**	**Chromium, Total**
7.120	77.810	700.550	0.188	414.370	3730.737	**1571.47**	**14339.49**	4600.0	610.0	100.0	**25264.40**	3319.40	514.40	**180.0**	**Nickel (a,b)**
0.182	0.342	3.199	0.187	1.828	17.077	**6.43**	**65.14**	N/A	N/A	5.0	**NA**	NA	26.59	**5.0**	**Cadmium (a,b)**
0.920	4.210	108.024	0.121	34.882	895.128	**131.21**	**3443.16**	N/A	N/A	5.0	**NA**	NA	22.90	**45.0**	**Lead (a,b)**
0.006	0.770	1.400	1.000	0.770	1.400	**2.94**	**5.37**	0.051	0.05	2.0	**0.25**	0.25	10.97	**0.4**	**Mercury (T) (c,e)**
3.649	N/A	7.297	1.000	NA	7.297	**N/A**	**15.87**	N/A	N/A	N/A	**NA**	NA	NA	**5.0**	**Silver (a,b,f)**
3.280	176.863	175.428	0.109	1616.147	1603.035	**6211.18**	**6160.69**	26000.0	7400.0	N/A	**142983.60**	40683.60	NA	**200.0**	**Zinc (a,b)**
2.600	5.200	22.000	1.000	5.200	22.000	**11.31**	**75.99**	140.0	140.0	200.0	**757.00**	757.00	1087.00	**230.0**	**Cyanide (d)**
								15000.0	1300.0	1000.0	**82500.00**	7150.00	5500.00	**15.0**	**Toluene**
								510.0	22.0	5.0	**2805.00**	121.00	27.50	**3.0**	**Benzene**
								N/A	N/A	200.0	**NA**	NA	1100.00	**30.0**	**1,1,1 Trichloroethane**
								2100.0	530.0	700.0	**11550.00**	2915.00	3850.00	**4.0**	**Ethylbenzene**
								16.0	2.3	5.0	**88.00**	12.65	27.50	**15.0**	**Carbon Tetrachloride**
								4700.0	57.0	N/A	**25850.00**	313.50	NA	**85.0**	**Chloroform**
								33.0	6.9	5.0	**181.50**	37.95	27.50	**25.0**	**Tetrachloroethylene**
								300.0	25.0	5.0	**1650.00**	137.50	27.50	**10.0**	**Trichloroethylene**
								10000.0	140.0	100.0	**NA**	770.00	550.00	**1.5**	**1,2 trans Dichloroethylene**
								5900.0	46.0	N/A	**32450.00**	253.00	NA	**50.0**	**Methylene Chloride**
								860000.0	10000.0	N/A	**4730000.00**	55000.00	NA	**50.0**	**Total Phenols**
								N/A	N/A	N/A	**NA**	NA	NA	**1.0**	**Naphthalene**
								N/A	N/A	N/A	**NA**	NA	NA	**64.5**	**Total Phthalates**
5.500	11.000	19.000	1.000	11.000	19.000	**47.85**	**109.45**	NA	NA	NA	**NA**	NA	NA	**n/a**	**Chlorine (T. Res.)**

which Fish & Aquatic Life Criteria are expressed as a function of total hardness.
metal is in the dissolved form at lab conditions. The calculated effluent concentration is in the total recoverable form.
or mercury is not converted to dissolved, since it is based on fish tissue data rather than toxicity.
arameter is in the total form.
on established that 0.006 ug/L would be maximum background default if no sample data available or if all samples were <RDL (<0.2 ug/L), based on reference stream monitoring by DOE.
x if column 8 is most stringent.
result in a negative number, use results from columns 5 or 6, respectively.
3 or 14 result in a negative number, use results from columns 9, 10 or 11, respectively, as applicable.

uded in river use so pick from columns 7,8,12,13,14,15 or Domestic supply not included in river use so pick from columns 7, 8 or 15.
for stream use classifications other than Fish & Aquatic Life are based on the 30Q5 flow.

SAR Summary

	PTL	85% PTL	PTL	Apr-14	Oct-13	Apr-13	Oct-12	Apr-12	Oct-11	Apr-11	Oct-10	Apr-10	Oct-09
TN 0056103	9/10/2013		10/20/2005										
COPPER	**0.08000**	**0.06800**	**0.08000**	0.03183	0.01800	0.01407	0.00893	0.00620	0.01093	0.00630	0.01430	0.01260	0.02717
CHROMIUM, III	**report**	**n/a**	**n/a**	0.01000	0.01000	0.01000	0.01000	0.01000	0.00100	0.00100	0.01000	0.01000	
CHROMIUM, VI	**0.03820**	**0.03247**	**n/a**	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	
CHROMIUM, TOTAL	**n/a**	**n/a**	**0.06000**	0.00150	0.00108	0.00102	0.00105	0.00102	0.00100	0.00100	0.00100	0.00100	0.00110
NICKEL	**0.18000**	**0.15300**	**0.18000**	0.00295	0.00292	0.00312	0.00317	0.00352	0.00335	0.00240	0.01428	0.02000	0.02000
CADMIUM	**0.00500**	**0.00425**	**0.00490**	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
LEAD	**0.04500**	**0.03825**	**0.04094**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
MERCURY	**0.00025**	**0.00021**	**0.00040**	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00021	0.00020	0.00020
SILVER	**0.00500**	**0.00425**	**0.00500**	0.00055	0.00050	0.00050	0.00050	0.00050	0.00050	0.00051	0.00050	0.00050	0.00050
ZINC	**0.20000**	**0.17000**	**0.20000**	0.03350	0.03650	0.04083	0.03850	0.04633	0.06400	0.03600	0.03800	0.03280	0.10517
CYANIDE	**0.01131**	**0.00961**	**0.01125**	0.00050	0.00050	0.00500	0.00500	0.00500	0.00517	0.00500	0.00620	0.00500	0.00500
TOLUENE	**0.01500**	**0.01275**	**0.01500**	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
BENZENE	**0.00300**	**0.00255**	**0.00300**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
1,1,1 TRICHLOROETHANE	**0.03000**	**0.02550**	**0.03000**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
ETHYLBENZENE	**0.00400**	**0.00340**	**0.00400**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
CARBON TETRACHLORIDE	**0.01500**	**0.01275**	**0.01500**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
CHLOROFORM	**0.08500**	**0.07225**	**0.08500**	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
TETRACHLOROETHYLENE	**0.02500**	**0.02125**	**0.02500**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
TRICHLOROETHYLENE	**0.01000**	**0.00850**	**0.01000**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
1,2 TRANSDICHLOROETHYL	**0.00150**	**0.00128**	**0.00150**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
METHYLENE CHLORIDE	**0.05000**	**0.04250**	**0.05000**	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
TOTAL PHENOLS	**0.05000**	**0.04250**	**0.05000**	0.04000	0.04000	0.04000	0.04000	0.04000	0.04000	0.04000	0.04000	0.04300	0.04000
NAPHTHALENE	**0.00100**	**0.00085**	**0.00100**	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
TOTAL PHTHALATES	**0.03900**	**0.03315**	**0.03900**	0.01500	0.01800	0.00600	0.00600	0.00600	0.00600	0.00600	0.00600	0.01000	0.03100

Bolded in effluent data exceeds 85% of proposed PTLs
Shaded means detection level

APPENDIX 4 – WQ BASED EFFLUENT CALCULATIONS-OTHER COMPOUNDS

WATER QUALITY BASED EFFLUENT CALCULATIONS
OUTFALL 001

FACILITY: Columbia STP
PERMIT #: TN0056103
DATE: 9/3/2014

Stream (1Q10) [MGD]	Stream (30Q5) [MGD]	Waste Flow [MGD]	Ttl. Susp. Solids [mg/l]	Hardness (as CaCO3) [mg/l]	Margin of Safety [%]
67.0	100.0	10.0	16	161	50

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Stream	Dectection Levels			F & AL- instream allowable		Calc. Effluent Concentration		Human Health Water Quality Criteria (30Q2)						avg. daily	
Bckgrnd.	Scan	WQC RDL		ambient conditions (Tot)		based on F & AL, Ca		In-Stream Criteria			Calc. Effluent Concentration, Ca			effluent	
Conc.	MDL	*EPA MDL		Chronic	Acute	Chronic	Acute	Organisms	Water/Organisms	DWS	Organisms	Water/Organisms	DWS	(<,=), Cw	
PARAMETER	[ug/l]	[ug/l]	[ug/l]		[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	ug/l	**PARAMETER**
ANTIMONY		3.8	3.0						4300.0	14.0	6.0	23650.0	77.0	33.0	<1	ANTIMONY
ARSENIC		1.0	1.0		190.0	360.0	731.500	1386.00	50.0	50.0	50.0	275.0	275.0	275.0	1.1	ARSENIC
BERYLLIUM		2.0	1.0								4.0			22.0	<2	BERYLLIUM
SELENIUM		5.0	2.0		5.0	20.0	19.250	77.000	4200.0	170.0	50.0	23100.0	935.0	275.0	1.2	SELENIUM
THALLIUM		5.0	*						6.3	1.7	2.0	34.7	9.4	11.0	<1	THALLIUM
ACROLEIN	0.0	50.0	1.0						9.0	6.0		49.5	33.0		<50	ACROLEIN
ACRYLONITRILE	0.0	50.0	1.0						6.6	0.6		36.3	3.2		<10	ACRYLONITRILE
BENZENE	0.0	1.0	1.0						710.0	12.0	5.0	3905.0	66.0	27.5	<1	BENZENE
BROMOFORM	0.0	1.0	1.0						3600.0	43.0		19800.0	236.5		<1	BROMOFORM
CARBON TETRACHLORIDE	0.0	1.0	1.0						44.0	2.5	5.0	242.0	13.8	27.5	<1	CARBON TETRACHLORIDE
CLOROBENZENE	0.0	1.0	*						21000.0	680.0		115500.0	3740.0		<1	CLOROBENZENE
CHLORODIBROMO-METHANE	0.0	1.0	*						340.0	4.1		1870.0	22.6		<1	CHLORODIBROMO-METHANE
CHLOROETHANE	0.0	1.0	*												<5	CHLOROETHANE
2-CHLORO-ETHYLVINYL ETHER	0.0	1.0	*												<50	2-CHLORO-ETHYLVINYL ETHER
CHLOROFORM	0.0	5.0	0.5						4700.0	57.0		25850.0	313.5		<5	CHLOROFORM
DICHLOROBROMO-METHANE	0.0	1.0	1.0						460.0	5.6		2530.0	30.8		<1	DICHLOROBROMO-METHANE
1,1-DICHLOROETHANE	0.0	1.0	1.0						32.0	0.6	7.0	176.0	3.1	38.5	<1	1,1-DICHLOROETHANE
1,2-DICHLOROETHANE	0.0	1.0	1.0						990.0	3.8	5.0	5445.0	20.9	27.5	<1	1,2-DICHLOROETHANE
TRANS 1,2-DICHLORO-ETHYLENE	0.0	1.0	*						140000	700.0	100.0	770000	3850.0	550.0	<1	TRANS 1,2-DICHLORO-ETHYLENE
1,1-DICHLOROETHYLENE	0.0	1.0	1.0												<1	1,1-DICHLOROETHYLENE
1,2-DICHLOROPROPANE	0.0	1.0	*						39.0	0.5	5.0	214.5	2.9	27.5	<1	1,2-DICHLOROPROPANE
1,3-DICHLORO-PROPYLENE	0.0	1.0	1.0						1700.0	10.0		9350.0	55.0		<1	1,3-DICHLORO-PROPYLENE
ETHYLBENZENE	0.0	1.0	1.0						29000	3100.0	700.0	159500.0	17050.0	3850.0	<1	ETHYLBENZENE
METHYL BROMIDE	0.0	1.0	*						4000.0	48.0		22000.0	264.0		<5	METHYL BROMIDE
METHYL CHLORIDE	0.0	1.0	1.0												<2.5	METHYL CHLORIDE
METHYLENE CHLORIDE	0.0	5.0	1.0						16000.0	47.0		88000.0	258.5		<5	METHYLENE CHLORIDE
1,1,2,2-TETRACHLORO-ETHANE	0.0	1.0	0.5						110.0	1.7		605.0	9.4		<1	1,1,2,2-TETRACHLORO-ETHANE
TETRACHLORO-ETHYLENE	0.0	1.0	0.5						88.5	8.0	5.0	486.8	44.0	27.5	<1	TETRACHLORO-ETHYLENE
TOLUENE	0.0	1.0	1.0						200000	6800.0	1000.0	1100000	37400.0	5500.0	<5	TOLUENE
1,1,1-TRICHLOROETHANE	0.0	1.0	1.0								200.0			1100.0	<1	1,1,1-TRICHLOROETHANE
1,1,2-TRICHLOROETHANE	0.0	1.0	0.2						420.0	6.0	5.0	2310.0	33.0	27.5	<1	1,1,2-TRICHLOROETHANE
TRICHLORETHYLENE	0.0	1.0	1.0						810.0	27.0	5.0	4455.0	148.5	27.5	<1	TRICHLORETHYLENE
VINYL CHLORIDE	0.0	1.0	2.0						5250.0	20.0	2.0	28875.0	110.0	11.0	<1	VINYL CHLORIDE

P-CHLORO-M-CRESOL	0.0	10.0	*												<1	P-CHLORO-M-CRESOL
2-CHLOROPHENOL	0.0	10.0	*						400.0	120.0		2200.0	660.0		<1	2-CHLOROPHENOL
2,4-DICHLOROPHENOL	0.0	10.0	*						790.0	93.0		4345.0	511.5		<1	2,4-DICHLOROPHENOL
2,4-DIMETHYLPHENOL	0.0	10.0	*						2300.0	540.0		12650.0	2970.0		<1	2,4-DIMETHYLPHENOL
4,6-DINITRO-O-CRESOL	0.0	10.0	24.0						765.0	13.4		4207.5	73.7		<1	4,6-DINITRO-O-CRESOL
2,4-DINITROPHENOL	0.0	10.0	42.0						14000.0	70.0		77000.0	385.0		<1	2,4-DINITROPHENOL
2-NITROPHENOL	0.0	10.0	*												<1	2-NITROPHENOL
4-NITROPHENOL	0.0	10.0	*												<1	4-NITROPHENOL
PENTACHLOROPHENOL	0.0	10.0	5.0		13.000	20.000	50.1	77.0	82.0	2.8	1.0	451.0	15.4	5.5	<1	PENTACHLOROPHENOL
PHENOL	0.0	10.0	*						860000	10000.0		4730000	55000.0		<1	PHENOL
2,4,6-TRICHLOROPHENOL	0.0	10.0	2.7						65.0	21.0		357.5	115.5		<1	2,4,6-TRICHLOROPHENOL
ACENAPHTHENE	0.0	10.0	*						2700.0	1200.0		14850.0	6600.0		<1	ACENAPHTHENE
ACENAPHTHYLENE	0.0	10.0	2.3												<1	ACENAPHTHYLENE
ANTHRACENE	0.0	10.0	0.7						110000	9600.0		605000	52800.0		<1	ANTHRACENE
BENZIDINE	0.0	50.0	*						0.0054	0.0012		0.030	0.0		<10	BENZIDINE
BENZO(A)ANTHRACENE	0.0	10.0	0.3						0.49	0.044		2.7	0.2		<1	BENZO(A)ANTHRACENE
BENZO(A)PYRENE	0.0	10.0	0.3						0.49	0.044	0.2	2.7	0.2	1.1	<1	BENZO(A)PYRENE
3,4 BENZO-FLUORANTHENE	0.0	10.0	0.3						0.49	0.044		2.7	0.2		<1	3,4 BENZO-FLUORANTHENE
BENZO(GHI)PERYLENE	0.0	10.0	*												<1	BENZO(GHI)PERYLENE
BENZO(K)FLUORANTHENE	0.0	10.0	0.3						0.49	0.044		2.7	0.2		<1	BENZO(K)FLUORANTHENE
BIS (2-CHLOROETHOXY) METHANE	0.0	10.0	*												<10	BIS (2-CHLOROETHOXY) METHANE
BIS (2-CHLOROETHYL)-ETHER	0.0	10.0	1.0						14.0	0.31		77.0	1.7		<10	BIS (2-CHLOROETHYL)-ETHER
BIS (2-CHLOROISO-PROPYL) ETHER	0.0	10.0	*						170000	1400.0		935000	7700.0		<10	BIS (2-CHLOROISO-PROPYL) ETHER
BIS (2-ETHYLHEXYL) PHTHALATE	0.0	10.0	2.5						59.0	18.0	6.0	324.5	99.0	33.0	1.1	BIS (2-ETHYLHEXYL) PHTHALATE
4-BROMOPHENYL PHENYL ETHER	0.0	10.0	*												<10	4-BROMOPHENYL PHENYL ETHER
BUTYL BENZYL PHTHALATE	0.0	10.0	*						5200.0	3000.0		28600.0	16500.0		<10	BUTYL BENZYL PHTHALATE
2-CHLORONAPHTHALENE	0.0	10.0	*						4300.0	1700.0		23650.0	9350.0		<1	2-CHLORONAPHTHALENE
4-CHLORPHENYL PHENYL ETHER	0.0	10.0	*												<10	4-CHLORPHENYL PHENYL ETHER
CHRYSENE	0.0	10.0	2.5						0.49	0.044		2.7	0.2		<1	CHRYSENE
DI-N-BUTYL PHTHALATE	0.0	10.0	2.5						12000.0	2700.0		66000.0	14850.0		<1	DI-N-BUTYL PHTHALATE
DI-N-OCTYL PHTHALATE	0.0	10.0	*												<1	DI-N-OCTYL PHTHALATE
DIBENZO(A,H) ANTHRACENE	0.0	10.0	*						0.49	0.044		2.7	0.2		<1	DIBENZO(A,H) ANTHRACENE
1,2-DICHLOROBENZENE	0.0	1.0	2.0						17000.0	2700.0		93500.0	14850.0		<1	1,2-DICHLOROBENZENE
1,3-DICHLOROBENZENE	0.0	5.0	2.0						2600.0	400.0		14300.0	2200.0		<1	1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE	0.0	5.0	2.0						2600.0	400.0		14300.0	2200.0		<1	1,4-DICHLOROBENZENE
3,3-DICHLOROBENZIDINE	0.0	10.0	*						0.77	0.4		4.2	2.2		<10	3,3-DICHLOROBENZIDINE
DIETHYL PHTHALATE	0.0	10.0	1.9						120000	23000.0		660000	126500.0		<1	DIETHYL PHTHALATE
DIMETHYL PHTHALATE	0.0	10.0	1.6						2900000	313000.0		15950000	1721500.0		<1	DIMETHYL PHTHALATE
2,4-DINITROTOLUENE	0.0	10.0	1.0						91.0	1.1		500.5	6.1		<10	2,4-DINITROTOLUENE
2,6-DINITROTOLUENE	0.0	10.0	*												<10	2,6-DINITROTOLUENE
1,2 DIPHENYLHYDRAZINE	0.0	10.0	*						5.4	0.4		29.7	2.2		<10	1,2 DIPHENYLHYDRAZINE
FLUORANTHENE	0.0	10.0	2.2						370.0	300.0		2035.0	1650.0		<1	FLUORANTHENE
FLUORENE	0.0	10.0	0.3						14000.0	1300.0		77000.0	7150.0		<1	FLUORENE
HEXACHLOROBENZENE	0.0	10.0	1.9						0.0077	0.0075	1.0	0.042	0.0	5.5	<1	HEXACHLOROBENZENE
HEXACHLOROBUTADIENE	0.0	10.0	5.0						500.0	4.4		2750.0	24.2		<10	HEXACHLOROBUTADIENE
HEXACHLOROCYCLO-PENTADIENE	0.0	10.0	*						17000.0	240.0	5.0	93500.0	1320.0	27.5	<10	HEXACHLOROCYCLO-PENTADIENE
HEXACHLOROETHANE	0.0	10.0	0.5						89.0	19.0		489.5	104.5		<10	HEXACHLOROETHANE
INDENO(1,2,3-CD)PYRENE	0.0	10.0	*						0.49	0.044		2.7	0.2		<1	INDENO(1,2,3-CD)PYRENE
ISOPHORONE	0.0	10.0	*						26000	360.0		143000.0	1980.0		<10	ISOPHORONE
NAPHTHALENE	0.0	10.0	*												<1	NAPHTHALENE
NITROBENZENE	0.0	10.0	10.0						1900.0	17.0		10450.0	93.5		<10	NITROBENZENE
N-NITROSODI-N-PROPYLAMINE	0.0	10.0	*						1.4	0.005		7.7	0.0		<10	N-NITROSODI-N-PROPYLAMINE
N-NITROSODI- METHYLAMINE	0.0	10.0	*						81.0	0.0069		445.5	0.0		<10	N-NITROSODI- METHYLAMINE
N-NITROSODI-PHENYLAMINE	0.0	10.0	*						160.0	50.0		880.0	275.0		<10	N-NITROSODI-PHENYLAMINE
PHENANTHRENE	0.0	10.0	0.7												<1	PHENANTHRENE
PYRENE	0.0	10.0	0.3						11000.0	960.0		60500.0	5280.0		<1	PYRENE
1,2,4-TRICHLOROBENZENE	0.0		*								70.0			385.0	<10	1,2,4-TRICHLOROBENZENE

a. Columns 7-8, and 12-14 are the effluent concentrations allowable to prevent exceedence of water quality criteria.

b. Potential to exceed criteria exists if the measured quantity in column 15 exceeds, or could exceed, the calculated allowable concentrations in columns 7-8, and 12-14.

c. Additional testing is required if the detection level used in the scan is higher than the state RDL and/or the MDL of the approved EPA scan method and industry is known to have that pollutant.

d. All background concentrations for these volatile organic, acid-extractable, and base-neutral compounds are assumed zero in the absence of supporting monitoring data.

e. Other metals for which data were provided on the application are evaluated on the Metals & Toxics spreadsheet.

f. Reasonable potential does not exist for the following reason(s):

The required MDL has been used and resulted in non-detection (BDL) or the contributing industrial processes are NOT likely to contain them.

APPENDIX 5 – NUTRIENT LIMITS - PHOSPHORUS

This permit incorporates terms and conditions consistent with the state water quality standards and permit regulations. This rationale represents the permit writer's outline for analyzing conditions, evaluating options and imposing requirements to a point source discharging into a nutrient impaired waterbody. This permit strategy is not to be confused with the state's nutrient reduction strategy (NRS) currently being developed separately from individual NPDES actions. The future nutrient reduction strategy will:

- Prioritize watersheds
- Set watershed load reduction goals
- Ensure effectiveness of point source permits
- Develop implementable watershed-scale plans that maximize the effectiveness of agricultural BMPs
- Ensure nutrient reductions from non-MS4 developed communities
- Include watershed-based monitoring programs to evaluate effectiveness

The timeline for completing the NRS development is not established. Therefore, this permit considers every item in the outline below except for item 5):

1) Initiate NPDES Permit Action
   a) Permit renewals
   b) Permit modifications (for activity with potential to increase nutrient loading)
   c) Enforcement actions (with potential to increase nutrient loading)

2) Verify, Document and Reference Division's Water Quality Information for Nutrients
   a) Review Assessment Database (ADB) for:
      i) Any form of Nitrogen
      ii) Any form of Phosphorous
      iii) Overall characterization of the receiving discharge segment (causes, sources)
      iv) Downstream discharge segment(s) - if degraded by activity
      v) If necessary, consult with Planning and Standards staff
   b) Review Water Quality (Ambient) Monitoring Data
      i) Chemical data < 5 Years Old

ii) Macro-invertebrate or bio-recon < 5 Years Old

iii) Alternate assessment review/rationale if data .> 5 Years Old

iv) Verify eco-regional goals not met

v) If necessary, consult with planning and standards staff (Linda Cartwright)

3) Develop NPDES Permit with EPA Approved TMDL WLAs

a) Allow three year compliance schedule unless TMDL establishes less time

b) Consider applicability of any proposed TMDL

4) Impose Anti-Degradation Nutrient Limits (during compliance period, if applicable)

a) Based on three samples minimum

b) Consider facility specific factors supplied by the permittee

c) Apply as 6-month or annual load limit (discuss rationale for the decision)

5) Impose Nutrient Reduction Strategy Limits (after the compliance period)

a) Implement Best Attainable Condition (BAC) based on USGS SPARROW-HUC 10 Model (or HUC 12 model results, if available)

6) Associate with Compliance Schedule (minimum one year for Treatment Optimization Plan, three years for construction)

a) Impose biological and chemical stream monitoring plan to evaluate results

The water quality assessment and permit development considerations are best understood in consideration of the water quality standards and permit rules currently applicable to this discharge. Water quality standards include both a narrative criterion and an anti-degradation provision. The permit regulation imposes narrative criteria in addition to minimum treatment standards.

Water Quality Standards

State water quality standards impose a narrative nutrient criterion to protect the fish and aquatic life designated use of streams in Tennessee. This criterion requires that nutrient levels in streams do not stimulate aquatic plant and/or algae growth to the extent that aquatic habitat is substantially reduced and/or the biological integrity fails to meet regional goals. The division interprets the primary goal to be for water to support a macro-invertebrate community comparable to biological communities found in eco-region reference streams which are not subject to impacts by society activities such as farming, urban runoff and point source discharges. The measureable goal of the narrative standard is the target

index score established for each set of eco-regions in the state. An eco-region is a relatively homogenous area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, and other ecologically relevant variables. The index score is sum of matrix scores based on the quantity and types of macro-invertebrates in a stream biological survey.

For assessment purposes, the division also compares the ambient level of nutrients in a stream to the 90th percentile values seen in comparable eco-region reference streams. Whenever the ambient levels are consistently elevated above the reference stream value, the division considers that stream as having unavailable conditions for nutrients. Unavailable conditions necessitate development of effluent limitations consistent with the state anti-degradation policy. The anti-degradation policy specifically requires that discharges not further a condition of impairment.

Permit Standards

In addition to establishing minimum treatment levels for technology, the permit regulation also requires the commissioner[1] to set effluent limits in each permit which will indicate adequate operation or performance of treatment units used and which will appropriately limit harmful parameters present in the wastewater. Therefore, the permit writer considers site specific factors to determine if more stringent controls are warranted at the time of permit issue. Site specific factors include type of treatment, permit compliance factors, actual flow rate, design flow rate, and stream flow rate. Permit specific considerations are detailed below following discussion on the receiving stream assessment.

Water Quality Assessment of Receiving Stream

The ambient phosphorus level meets the unavailable condition below Outfall 001. River segment TN06040002036_1000 was assessed in 2005 as impaired, or projected to need additional controls, for dissolved oxygen and total phosphorus based on chemical sampling in the receiving stream. Chemical sampling below Outfall 001 reflect that the ambient phosphorus level averages 0.39 mg/L as compared to the 90th percentile target value of 0.018 mg/L found in reference streams in Eco-region 7. Some of the sampling locations are in the river adjacent to the former phosphate mining and processing site.

Biological integrity though currently meets water quality goals. Benthic sampling in 2004 at river mile 130.5 upstream of Outfall 001 met eco-region reference stream goals. Benthic sampling in 2008 by the TVA both up and down stream at river miles 132.7 and 113.9 respectively also achieved eco-region reference stream goals. This means that controls on phosphorus is necessary for anti-degradation purposes but not for affecting a change in biological integrity.

Municipal wastewater is a source of nutrients. Therefore, effluent limitations on nutrients must be considered in this permit. This permit develops limits that are consistent with the state-wide nutrient reduction strategy being developed by the division.

[1] Rule 0400-40-05-.09

Planned State-wide Nutrient Reduction Strategy

On a state-wide basis, use of SPARROW is considered a pre-Total Maximum Daily Load (TMDL) approach with the goal of attaining use support. The term “SPARROW” refers to SPAtially Referenced Regressions On Watershed attributes, a model that relates in-stream water-quality data to spatially referenced characteristics of watersheds, including contaminant sources and transport factors. The SPARROW model performs a nonlinear least squares multiple regression on hydrologic elements to determine constituent load. The modeling employs the concepts of an enrichment factor (EF), best attainable condition (BAC), and aggregated WWTP loads to develop a decision making matrix of performance levels for both phosphorus and nitrogen. Both matrices are calculated and applied independently.

The best attainable condition (BAC) is the applicable water quality requirement to implement narrative standards for nitrogen and phosphorus. This strategy approach sets realistic numeric percent reduction goals that result in the best possible conditions given available BMPs and other pollutant controls. To achieve the water quality requirement, the strategy ultimately prescribes a reduction in pollutants discharged from point sources and the implementation of BMPs that mitigate or reduce the adverse effects of stressors on the stream’s overall ecology.

The loadings from the SPARROW model are used to determine the enrichment factor. Atmospheric deposition load represents background for nitrogen and soil-parent rock (S-P R) load represents background for phosphorus. Enrichment factors for nitrogen and phosphorus were calculated for each HUC 10 watershed. The calculated EFs and percent WWTP contributions for HUC 10 watersheds were used to derive thresholds for a decision-making matrix to determine the appropriate level of control from WWTPs to achieve the BAC.

The SPARROW model is developed and supported by the United States Geological Survey (USGS) for regional watersheds in the nation. Tennessee watersheds fall into three of these models: Southeast Region, Great Lakes, and Mississippi. At the present time, the USGS has only calibrated the Southeast Region model using broad inputs generalized for the southeast United States. The state intends to use SPARROW when calibrated for Tennessee watersheds such that it models the cumulative effects of upstream watersheds. The division uses the southeast regional calibration to develop permit limits for watersheds where the division determines that the model fits the local watershed conditions (e.g. Little Pigeon River watershed in Sevier County). This model is still being calibrated for the Duck River watersheds, so a permit strategy used that is consistent with objectives of the state-wide nutrient reduction strategy.

Limit Development

Immediately, the permit imposes limits based on actual loadings to cap the loadings at their present levels. These loadings are imposed as annual rolling averages. Evaluating alternatives for treatment and disposal are an integral factor in the state antidegradaton policy. Load limits, versus concentration limits, give credit for any waste water diverted from the outfall for reuse and thereby encourages reuse alternatives. Since the treatment facility is not designed to remove nutrients and also since incidental biological removals of nutrients

are functions of other variables, annual rolling average loads allow operational flexibility in achieving the load limits. The monitoring frequency is once per week due to the flow variability in this system.

These limits are imposed in Part 1 of the permit and were derived as follows:

The data from February 2009 was discarded as an outlier since both the influent concentration and effluent concentration were more than 2 times the standard deviation from the mean of the dataset. Based on the remaining data, the 95th percentile for effluent phosphorus is 3.1 mg/L. This value will be used with the current long term average effluent flow rate to establish a load limit.

Columbia STP, Total Phosphorus

Date		Influent			Effluent			Percent Removal	Eff	
	Rainfall	Flow	Concentration	Loading	Flow	Concentration	Loading		Conc.	
	inches	MGD	mg/L	lb	MGD	mg/L	lb		mg/L	
1/28/2009	0.88	4.54	2.2	83.3						
1/29/2009	0.13				6.72	1.7	95.3	-14.4%	1.7	
2/26/2009	0.08	3.79	8.2	259.2						
2/27/2009	0.02				3.28	4.9	134.0	48.3%		
3/25/2009	0.35	4.93	5.6	230.3						
3/26/2009	1.33				5.2	2.8	121.4	47.3%	2.8	
7/22/2009	0.9	3.09	5	128.9						
7/23/2009	0.22				2.47	2.9	59.7	53.6%	2.9	
3/19/2010		6.01	0.26	13.0						
3/20/2010					4.27	1.4	49.9	-282.6%	1.4	
7/27/2010	0.41	3.71	5.5	170.2						
7/28/2010					3.04	2.8	71.0	58.3%	2.8	
9/8/2010	0.03									
9/9/2010	0.01	3.72	6.4	198.6					2.9	
9/10/2010					2.65	2.9	64.1	67.7%		
12/16/2010	0.15	6.38	1.8	95.8						
12/17/2010	0.15				5.39	1.3	58.4	39.0%	1.3	
3/24/2011	0.2	4.3	6	215.2						
3/25/2011					3.28	2.3	62.9	70.8%	2.3	
6/9/2011		2.93	4.8	117.3						
6/10/2011					2.87	3.4	81.4	30.6%	3.4	
9/15/2011	0.31	3.48	5.6	162.5						
9/16/2011					3.17	2.6	68.7	57.7%	2.6	
12/6/2011	1.37									
12/7/2011	0.04									
12/8/2011	0.27	10.5	1.8	157.6						
12/9/2011					8.91	1.0	74.3	52.9%	1	
3/8/2012		5.18	4.4	190.1						
3/9/2012					6.69	1.5	83.7	56.0%	1.5	
6/14/2012		3.75	3.69	115.4						
6/15/2012					2.64	3.1	68.3	40.9%	3.1	
9/13/2012		4.01	5	167.2						
9/14/2012					2.76	2.9	66.8	60.1%	2.9	
12/10/2012		6.25	4.4	229.4						
12/11/2012	1.64				12.9	1.4	151.0	34.2%	1.4	
3/21/2013		6.16	2.8	143.8						
3/22/2013					4.71	1.3	51.1	64.5%	1.3	
6/17/2013		3.57	3.1	92.3						
6/18/2013	2.11				5.01	3	125.4	-35.8%	3	
9/17/2013		4.31	4.8	172.5						
9/18/2013					2.67	2.2	49.0	71.6%	2.2	
AVERAGE			4.3	154.9		2.4	80.9		3.1	95th mg/L
STDEV			1.9			0.97				
2 x STDEV + AVE			8.1			4.3				

MONTH	TSS In	TSS Out	TP % Removal	Q eff	Q in	Q diff	Eff TP
12/1/12	176	4.4	34	12.9	6.25	-6.65	1.4
3/1/12	168	4.5	56	6.69	5.18	-1.51	1.5
6/1/13	180	3.4	36	5.01	3.57	-1.44	3
6/1/11	239	6.5	31	2.87	2.93	0.06	3.4
9/1/11	136	4	58	3.17	3.48	0.31	2.6
12/1/10	156	4	39	5.39	6.38	0.99	1.3
3/1/11	178	5.2	71	3.28	4.3	1.02	2.3
9/1/10	221	5.1	67	2.65	3.72	1.07	2.9
6/1/12	236	6.6	41	2.64	3.75	1.11	3.1
9/1/12	191	4.6	60	2.76	4.01	1.25	2.9
3/1/13	153	3.4	64	4.71	6.16	1.45	1.3
12/1/11	116	3.5	53	8.91	10.5	1.59	1
9/1/13	74	3	72	2.67	4.31	1.64	2.2

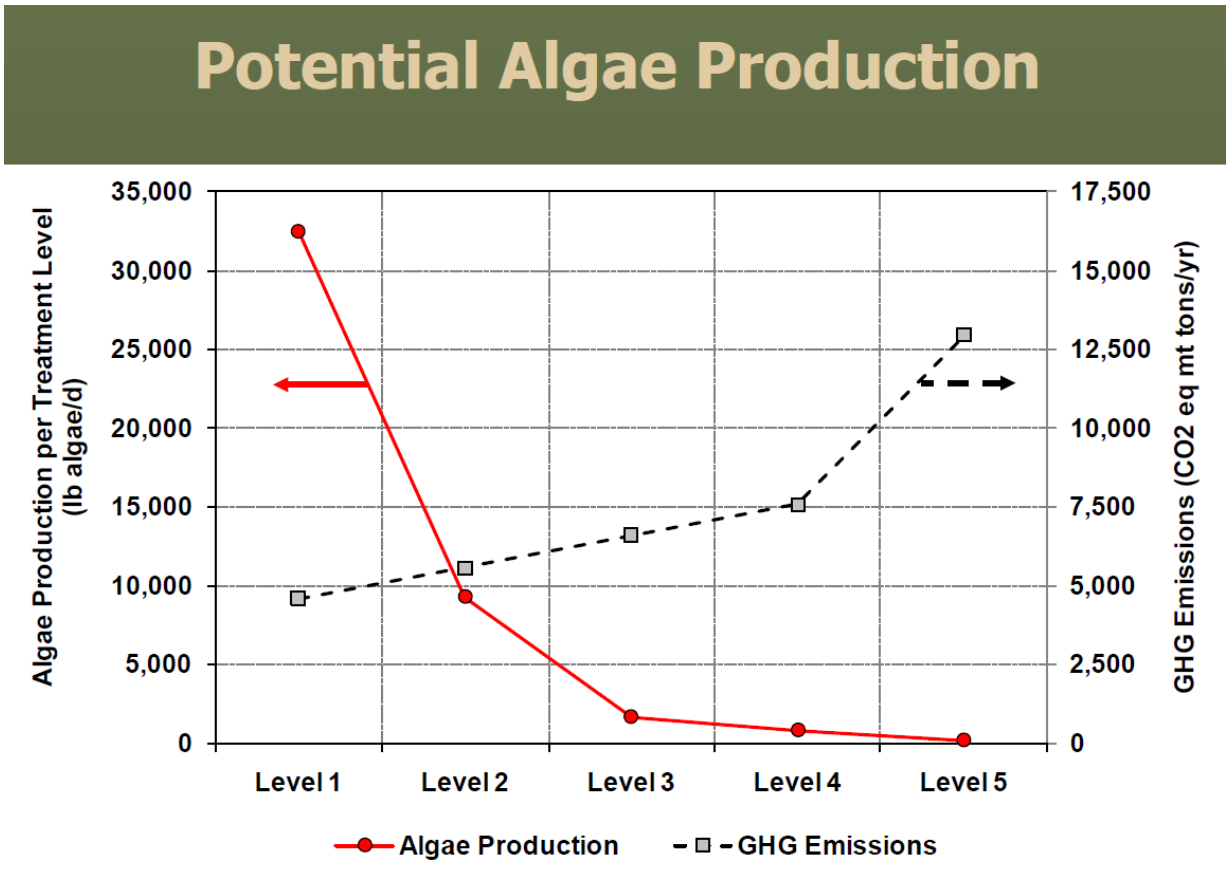
An analysis of phosphorus and flow data from 2010-2013 shows that the percentage of phosphorus removal increases proportionally to the ability of the hydraulics of the treatment facility to attenuate influent flow rate and increase hydraulic retention time. Therefore the focus of this facility needs to be to successfully remove inflow and infiltration through compliance with the terms and conditions of the EPA consent agreement and other steps as appropriate. Secondarily, the permittee will need to consider alternatives for treated wastewater reuse, treatment plant optimization or new nutrient removal processes when new customers are added to the system so that the phosphorus load limit is not exceeded.

The permit strategy for nutrients incorporates treatment plant optimization. This element is intended for existing facilities to optimize treatment controls within the existing facility to see if those changes can affect an improvement in the biological integrity of the receiving stream. When that element is used, the permit strategy sets target loads equivalent to average effluent concentrations of 8 mg/L total nitrogen and 1 mg/L total phosphorus on discharges to streams with some dilution available.

Research presented by the Water Environment Research Foundation (WERF) suggests a relationship between optimized removal rates and water quality impacts[2]. The research shows that a treatment level objective of 8 mg/l TN and 1 mg/l TP, results in a significant reduction in algae production level. This information is depicted in the following graphic:

[2] WERF 2011 Webinar Series, Water Environment Research Foundation, Nutrient Removal: Cost and Benefits, Degrees of Difficulty, and Regulatory Decision Making, October 5, 2011, A. Pramanik, PhD, BCEEM (WERF), M. Falk, PhD, J.B. Neethling, PhD, PE, BCEE, D. Reardon, PE, BCEE (HDR Engineering, Inc.)

Treatment Level Objectives Level	BOD (mg/L)	TSS (mg/L)	TN (mg N/L)	TP (mg P/L)
1	30	30	-	-
2	<30	<30	8	1
3	<30	<30	4-8	0.1-0.3
4	<30	<30	3	0.1
5	<30	<30	2	<0.02



In addition to optimization, the division permit strategy may include chemical and macroinvertebrate monitoring and reporting conditions in order for the permittee to reflect the benefit of plant optimization. These two components are not being included in this permit.

This treatment plant was overdesigned to treat inflow/infiltration, so the load limits established for the average 4.4 MGD flow (See DMR summary on Page R-50) will equate to target nutrient reduction strategy loads at its constructed design flow rate of 14 MGD.

Proposed Effluent Limit at current flow rate:

3.1 mg/L TP x 4.4 MGD x 8.34 = 114 lb/d

At 14 MGD, this load is equivalent to an effluent concentration of 1.0 mg/L:

114 lb/d / (8.34 x 14 MGD) = 0.98 mg/L

Therefore, the proposed limit is consistent with optimization goals. As previously stated, the benthic community currently achieves eco-region goals so optimization and ambient monitoring is not warranted at this time for those purposes.